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CAPSTONE PROJECT

**SOCIOCULTURAL-GEOSPATIAL
ANTHROPOLOGICAL PORTAL (SC-GAP):
ENHANCING SOCIOCULTURAL UNDERSTANDING
THROUGH CROWDSOURCED SERVICE MEMBER
NARRATIVES**

by

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June 2015

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CROWDSOURCED SERVICE MEMBER NARRATIVES**

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ABSTRACT

Despite the Department of Defense's (DOD) investment in programs designed to advance sociocultural knowledge, the DOD lacks a shared repository through which all entities can aggregate, visualize, and share sociocultural data across the enterprise. A gap analysis of DOD's desired and actual ability to achieve a sociocultural understanding reveals three shortcomings: data, repository, and collaboration. Therefore, we created a proof of concept that bridges the sociocultural gap by harnessing the overlooked potential of deployed service members and their cross-cultural experiences. Service member observations form an untapped resource of sociocultural data; this existing wellspring of sociocultural information needs to be collected and indexed using a common framework. Residing in a geodatabase and interfaced via a crowdsourced Geographic Information System (GIS), this framework aggregates the collected data of service member narratives for the greater Joint Force, thereby creating a dynamic and collaborative living repository. Combining an anthropologically sound and operationally relevant framework with the capabilities of GIS results in a solution that will allow DOD personnel to populate, visualize, and share near-real-time cultural data relevant to military operations across all services. This DOD enterprise solution can enhance the nation's armed forces' strategic performance through the application of culturally adept military power.

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LIST OF ACRONYMS AND ABBREVIATIONS

AO	Area of Operation
ASCOPE	Areas, Structures, Capabilities, Organizations, People, and Events
CA	Civil Affairs
COCOM	Combatant Command
CSV	Comma Separated Value
DA	Department of the Army
DCGS-A	Distributed Common Ground System—Army
DIME	Diplomatic, Information, Military, and Economic
DOD	Department of Defense
ESRI	Environmental Systems Research Institute
FM	Field Manual
GEN	General
GIS	Geographic Information System
HTS	Human Terrain System
JIPOE	Joint Intelligence Preparation of the Operational Environment
JFC	Joint Force Commander
JUONS	Joint Urgent Operational Needs Statement
NSS	National Security Strategy
OE	Operational Environment
OSD	Office of the Secretary of Defense

PAS	Pattern Analysis Section
POC	Proof of Concept
PMESII-PT	Political, Military, Economic, Social, Infrastructure, Information, Physical Environment, and Time
RC	Regional Command
SC-GAP	Sociocultural-Geospatial Anthropological Portal
SOCOM	Special Operations Command
SOF	Special Operations Forces
ToC	Table of Contents
TTP	Tactics, Techniques, and Procedures
USG	United States Government
VGI	Volunteered Geospatial Information

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—Mark Aschenbrenner

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—Jason Koo

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—Dan Toshner

I. INTRODUCTION

The Department of Defense (DOD) continues to struggle with defining, collecting, understanding, and analyzing a population's sociocultural framework, as well as how to best incorporate it into military planning and operations.¹ This struggle is exemplified by the disconnect that currently exists between desired and actual U.S. strategic performance in recent population-centric conflicts. The disconnect is the direct result of a persistent sociocultural gap that remains between the sociocultural data—the human domain—and decision makers who need to understand this “human domain.”² Even with the DOD's recent acknowledgement and realignment of strategy toward population-centric warfare, the disconnect remains due to disjointed service and branch specific sociocultural initiatives, limited availability of relevant data, and the absence of an enterprise solution to collect, aggregate and share the data.³ A gap analysis of the DOD's desired and actual states of achieving and implementing a sociocultural understanding reveal three main shortcomings: a data gap, a repository gap, and a collaboration gap. These shortcomings and subsequently generated requirements shape our proposed framework and recommended solution.

The narrative-based solution harnesses the overlooked and untapped sociocultural data-producing potential of today's deployed DOD service members, who over the course of their daily duties directly or indirectly are exposed to a population's pertinent sociocultural information. The existing wellspring of sociocultural information need only be collected and indexed using a framework derived from Salmoni and Holmes-Eber's

¹ Joel Lawton, “How the Military Intelligence Community has Failed to Incorporate Sociocultural Understanding of their Operational Environment,” *Small Wars Journal* (2014): 1.

² The human domain is the totality of the physical, cultural, and social environments that influence human behavior to the extent that success of any military operations or campaigns depends on the application of unique capabilities that are designed to fight and win population-centric conflicts. William H. McRaven, *USSOCOM Special Operations Forces Operating Concept* (Washington, DC: Government Printing Office, 2013).

³ Strategic Landpower Task Force, *Strategic Landpower: Winning the Clash of Wills*, ed. Raymond T. Odierno, James F. Amos and William H. McRaven (Washington, DC: Government Printing Office, 2013); McRaven, *USSOCOM Special Operations Forces Operating Concept*; Department of the Army, *The U.S. Army Operating Concept: Win in a Complex World* (Washington, DC: Government Printing Office, 2014).

Five Operational Culture Dimensions model to begin to bridge the overall sociocultural gap.⁴ Residing on a crowdsourced Geographic Information System (GIS) interface, this framework aggregates collected data, comprised of service member narratives, from the greater Joint Force, creating a dynamic and collaborative sociocultural living repository. By combining an anthropologically sound framework with operational relevance and the structure of a GIS, a resulting proof of concept allows DOD personnel to uniformly populate, visualize, and share near-real-time cultural data relevant to military operations across all services and agencies within the DOD. Ultimately, bridging the identified sociocultural gap within the DOD and providing an enterprise solution to “building a process from the sensor all the way to the political decision makers” best enhances the nation’s strategic performance through the application of culturally adept military power.⁵

⁴ Barak A. Salmoni and Paula Holmes-Eber, *Operational Culture for the Warfighter: Principles and Applications* (Quantico, VA: Marine Corp University Press, 2008), 15.

⁵ General Stanley McChrystal quoted in Michael T. Flynn, Matt Pottinger and Paul D. Batchelor, *Fixing Intel: A Blueprint for Making Intelligence Relevant in Afghanistan* (Center for New American Security, 2010), 9.

II. GAP ANALYSIS

Our Gap analysis first examines the national policy driving the shift and the DOD's resulting desired state of increased overall strategic performance through an integrated sociocultural understanding of the human domain. This desired state is contrasted with the actual DOD capabilities' "ways and means" to achieve that state, resulting in the identification of ongoing deficiencies, implications, and recommendations. By combining the recommended ways—a common sociocultural framework—with the recommended means—additional collectors, a collection mechanism, and a singular living repository—a solution collectively bridging the identified sociocultural gap is achieved.

A. DESIRED STATE

"You can be victorious at the tactical and operational level and never win." —General David Perkins, Former Commander, U.S. Army Training and Doctrine Command

The goal of warfare is trending more to the control of a population vice the geographical area.⁶ The 2010 and 2015 National Security Strategies (NSS) provide the foundational road map to addressing this shift, calling for a whole-of-government approach in engaging foreign civil societies.⁷ Of note, the 2010 NSS states, "the United States Government will make a sustained effort to engage civil society and citizens and facilitate increased connections among the American people and peoples around the world."⁸ This population-centric strategy can be seen carried through the subsequent 2011 National Military Strategy, 2012 National Defense Strategy, and 2014 Quadrennial

⁶ Marc W. Tyrrell, "The use of Evolutionary Theory in Modeling Culture and Cultural Conflict," in *Culture, Conflict, and Counterinsurgency*, ed. Thomas H. Johnson and Barry S. Zellen (Stanford, CA: Stanford University Press, 2014), 46.

⁷ Barack H. Obama, *The National Security Strategy of the United States of America* (Washington, DC: The White House, 2010); Barack H. Obama, *The National Security Strategy of the United States of America* (Washington, DC: The White House, 2015).

⁸ Obama, *The National Security Strategy of the United States of America*, (2010).

Defense Review, all of which suggest that the U.S. is at a strategic turning point.⁹ This new direction requires the Defense Department to invest in a concerted Joint Force, sprawling global connectedness, and increased partnership capacity to shape the global security environment. This is in stark contrast to the previous U.S. policy focused on the “actor” and military victory instead of the operational environment (OE) and population.¹⁰ Similarly, “Is Strategy an Illusion?” concludes that the military has focused “on how to destroy targets or defeat enemies tactically, assuming that positive military effects mean[t] positive policy effects.”¹¹ Acknowledging this shift, the DOD published an updated 2014 *The U.S. Army Operating Concept*, codifying within the Department of the Army a migration from the Soviet era tactical and operational AirLand power concept to the new strategically focused Unified Land Operations concept.¹² Understanding “war, as a political phenomenon, is inherently about people”; this concept explains how the Army will employ forces and capabilities to accomplish the national objectives.¹³ As recent conflicts have demonstrated, a sustainable global security environment hinges on the people; therefore, understanding the human domain—people—is a strategic imperative of U.S. strategy.

Based on the provided 2010 and 2015 national strategic guidance derived from recent lessons learned, the population-centric shift has now largely become the focus of the nation’s military decision makers as they seek how to not only be victorious in battle tactically, but to win strategically. Terms, such as “human terrain” and “human domain,” are now common in general military lexicon. A niche concept and core competency that had previously resided predominantly within the realm of Special Operations is now

9 Chuck Hagel, *The Quadrennial Defense Review 2014* (Washington, DC: Secretary of Defense, 2014); Michael G. Mullen, *The National Military Strategy of the United States of America 2011: Redefining America’s Military Leadership* (Washington, DC: The Joint Chiefs of Staff, 2011); Leon Panetta, *2012 Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* (Washington, DC: Office of the Secretary of Defense, 2012).

10 Lawton, *How the Military Intelligence Community has Failed to Incorporate Sociocultural Understanding of their Operational Environment*, 1.

11 Richard K. Betts, “Is Strategy an Illusion?” *International Security* 25, no. 2 (Oct 2000), 7.

12 Department of the Army, *The U.S. Army Operating Concept: Win in a Complex World*.

13 Ibid., 12.

permeating throughout the greater force. With a majority of recent global conflicts falling under the category of internal war or irregular engagements, population as the key terrain is applicable to the DOD writ large now more than ever.¹⁴ This shift and sentiment is echoed by the Strategic Landpower initiative's final analysis stating, "operations to wrest control of the physical domains are vital but insufficient to military success. Tactical and operational success depends in part on controlling or exploiting fleeting opportunities in the air, sea, land, cyber, and space domains. But strategic success lies in winning the clash of wills [the human domain]."¹⁵ The previous decades' "misunderstanding of cultures and [the U.S.] enemies' motivations" masked the underlying necessary objective—the human domain which ultimately led to the disparity between military victory and desired strategic performance.¹⁶ Only through understanding and incorporating the human domain into military planning and operations will the DOD achieve the desired strategic states necessary to successfully shape the greater global security environment.

B. DESIRED STATE REQUIREMENT

"Knowledge must become capability." —Carl von Clausewitz, *On War*

The national and DOD's strategic goals are inherently tied to the "human objective."¹⁷ Collectively understanding and influencing populations are a critical requirement in achieving the nation's goals. While McFate would argue this is a new requirement for today's military, conversely, Naficy argues that this requirement has always existed and is just a shift in prioritization.¹⁸ Regardless of either position on the

14 Lawton, *How the Military Intelligence Community has Failed to Incorporate Sociocultural Understanding of their Operational Environment*, 3; Department of the Army, *Insurgencies and Countering Insurgencies* (FM 3-24) (Washington, DC: Government Printing Office, 2014).

15 Strategic Landpower Task Force, *Strategic Landpower: Winning the Clash of Wills*, 6.

16 "Exaggerated Nation," *Foreign Policy*, last modified November 21, 2014, accessed December 10, 2014, <http://foreignpolicy.com/2014/11/21/exaggeration-nation>.

17 Strategic Landpower Task Force, *Strategic Landpower: Winning the Clash of Wills*, 4.

18 Montgomery McFate, "Anthropology and Counterinsurgency: The Strange Story of their Curious Relationship," *Military Review* (March-April 2005), 24–37; Siamak Naficy, "Of Culture and Cliche': Politics and the Uses (and Abuses) of Anthropology," *CTX Journal* 4, no. 4 (November 2014).

origin of the requirement, both concur that focusing on the human terrain vice just the physical terrain will play a critical role in shaping the impact and outcome of future military operations and strategic performance. The newly released 2014 Field Manual (FM) 3–24 *Insurgencies and Countering Insurgencies* supports this by claiming that the DOD “must seek to understand the local people and their culture and incorporate the perspectives and concerns of the population in their plans and operations.”¹⁹ Similarly, FM 3–07.22 *Counterinsurgency Operations* states the importance of “Understanding and working within the social fabric of a local area” vice attempting to cohabitate the same space or dismiss the existing fabric completely.²⁰ While these two examples draw from irregular warfare-centric manuals, as seen above, the requirement for understanding the culture and social fabric of the people within or impacting the area of operation (AO) is applicable across the conflict spectrum. Accordingly, the newest revision of *The U.S. Army Operating Concept* reflects this conclusion, noting one of its major changes “emphasizes the human, cultural, and political continuities of armed conflict as war will remain a contest of wills.”²¹ The human objective is a complex problem set, one that requires a collaborative sociocultural understanding of the people to best enable military operations and decision making.

C. ACTUAL STATE

Understanding DOD’s desired state and the resulting sociocultural requirement, the gap analysis next assesses the actual state of capabilities based on its ways and means of addressing the desired state. Addressing this requirement at the joint component command level is the Strategic Landpower Task Force, which encompasses the three land domain stakeholders of the DOD—Army, Marines, and Special Operations Command (SOCOM). Together this initiative looks to synchronize military action with national objectives through the fusion of both social and physical sciences and their application to

¹⁹ Department of the Army, *Insurgencies and Countering Insurgencies* (FM 3-24), 3-1.

²⁰ Department of the Army, *Counterinsurgency Operations* (FM3-07.22) (Washington, DC: Government Printing Office, 2004), 4-3; McFate, *Anthropology and Counterinsurgency: The Strange Story of their Curious Relationship*, 37.

²¹ Department of the Army, *The U.S. Army Operating Concept: Win in a Complex World*, 2.

war.²² Specifically this synchronization offers insight into the greater struggle within the DOD to gain a “fuller understanding and consideration of the human objective in the formulation of strategy, operational plans and tactical actions.”²³ Recognizing the influencing potential, proximity, and strategic necessity of land power assets to the human domain, the Task Force provides a normative roadmap to consolidate efforts between the land stakeholders. As for the means of accomplishing this, the Task Force currently serves solely as a think tank, providing conceptual guidance toward achieving the desired state. While the initial analysis of the human domain and unifying recommendations are aligned with the greater desired state of the DOD, the Task Force only provides prescriptive conceptual recommendations and justifications instead of any enactable solutions to fulfill the current collaborative sociocultural understanding requirement.

At the unified combatant command (COCOM) level, the 2013 *USSOCOM Special Operations Forces Operating Concept* addresses this sociocultural requirement through the establishment of the Global Special Operations Forces (SOF) initiative.²⁴ USSOCOM’s ways of accomplishing the desired state is through a significantly increased, globally projected, and integrated SOF footprint building foreign partnership capacity.²⁵ “These partnerships enable SOF to understand and influence relevant populations in support of U.S. Government efforts to enhance stability, prevent conflict and be prepared to fight and defeat adversaries when necessary.”²⁶ As previously noted, people are the key terrain for the forces that conduct operations other than maneuver focused. Consequently, two of the six key elements outlined in the new concept focus on understanding the human domain, and understanding and influencing the narrative.²⁷ These elements in turn help set the conditions from which the SOF means are developed.

²² Strategic Landpower Task Force, *Strategic Landpower: Winning the Clash of Wills*, 3.

²³ Ibid.

²⁴ McRaven, *USSOCOM Special Operations Forces Operating Concept*, 3.

²⁵ Ibid.

²⁶ Ibid., 1.

²⁷ McRaven, *USSOCOM Special Operations Forces Operating Concept*, 5.

The means to accomplish integrated global partnership revolves around the SOF operator, who with a cultural, linguistic, and regional expertise fills a “key and irreplaceable element of the network.”²⁸ Spanning over 78 countries, this Global SOF footprint provides the largest set of human sensors from whom one might collect sociocultural information.²⁹ Through the course of their normal duties, SOF personnel have extensive exposure to local populations. When combined with their existing expertise, this exposure creates an optimal means to fill the sociocultural requirement. In order for the achieved sociocultural knowledge to benefit the collective enterprise, it must be transportable and discoverable to the greater Joint Force. Currently this niche expertise remains primarily isolated within SOF community and often within the individual units themselves due to disjointed collection and reporting mechanisms. Only by harnessing this unique SOF sociocultural data and exporting it out to the greater force can the Joint Force better understand and influence relevant populations and improve its strategic performance.

The COCOM level has invested in two main capabilities to address the sociocultural requirement: Human Terrain Systems (HTS) and Pattern Analysis Section (PAS). Each of these initiatives was designed to provide niche human terrain support to their respective levels of command.

The Department of the Army’s (DA) HTS’ mission is to “support operational decision-making, enhance operational effectiveness, and preserve and share sociocultural institutional knowledge” across the Army.³⁰ According to the mission statement, HTS accomplishes this through: “recruiting, training, deploying, and supporting an embedded, operationally focused sociocultural capability; conducting operationally relevant, sociocultural research and analysis; and developing and maintaining a sociocultural

28 McRaven, *USSOCOM Special Operations Forces Operating Concept*, 10.

29 Keenan D. Yoho, “The Global SOF Network and the Global Special Operations Campaign Plan” (lecture, Naval Postgraduate School, Monterey, CA, August 12, 2014).

30 U.S. Army, “Human Terrain System,” *Military Intelligence Professional Bulletin* 37, no. 4 (Oct–Dec 2011): 11.

knowledge base.”³¹ Despite the relevance of the mission to the greater sociocultural requirement identified, HTS’ success has remained inconsistent and underutilized. This is due to the minimal focus on the second and equally critical part of the overall sociocultural requirement by the greater DOD community; the need to unify and integrate the sociocultural knowledge into military planning and operations. Consequently, HTS’ means became disjointed from their intended ways and the DOD’s desired end for which they were created.

Aligned with the respective geographical combatant commands (COCOMs), these multi-disciplinary teams of social scientists and military analysts have provided limited access to the populations, but they have faced disinterested or unfamiliar commanders with their products. Unfortunately, the Joint Force has perceived the teams as disjointed.³² Consequently, HTS’ impact resides primarily at the operational level, having little impact at the tactical or, based on the analysis above, the strategic level as well.³³ While their mission states that they are to provide a comprehensive sociocultural knowledge base, HTS’ efforts remain focused on phase III—Dominate—and phase IV—Stabilize—operations of the Joint Phasing model.³⁴ This narrow focus has significantly reduced HTS’ ability to array its means in support of the remaining phases, thus limiting their overall contribution to the desired state. Additionally, HTS lacks the resources to create, to maintain, and to broadly offer such a knowledge base to the Joint Force. While HTS does provide an unparalleled resource within the DA, in order for it to better fill the sociocultural requirement, HTS must be better integrated and employed within the force. By increasing HTS’ direct and indirect access to sociocultural data, by integrating their products into an enterprise data management solution, and by unifying its efforts with the Joint Force, HTS would be better postured to enable the achievement of strategic success.

31 U.S. Army, “Human Terrain System, 10.

32 “Petraeus Quietly Disses ‘Human Terrain’,” Wired.com, accessed September, 15, 2014, <http://www.wired.com/2010/09/petraeus-quietly-disses-human-terrain>.

33 Kevin R. Golinghorst, *Mapping the Human Terrain in Afghanistan* (Fort Leavenworth, Kansas: School of Advanced Military Studies, U.S. Army Command and General Staff College, 2010), 26.

34 U.S. Joint Chiefs of Staff, *Joint Operations Planning* (JP 5-0) (Washington, DC: U.S. Joint Chiefs of Staff, August 2011).

The second sociocultural initiative is the Pattern Analysis Section (PAS). PAS is a SOCOM-facilitated program that supports the DOD's efforts toward building sociocultural knowledge. This initiative supports the DOD's sociocultural initiatives by conducting multi-layer, multi-discipline pattern analysis. The PAS fuses data from multiple sources across the intelligence community to develop predictive, geospatial assessments in support of operations and planning for Special Operations.³⁵ The PAS accomplishes this through the use of multi-discipline analytical teams located at SOCOM and its subordinate Theater Special Operations Commands. While PAS, like HTS, is aligned with the greater sociocultural requirement, the initiative currently lacks integration into the greater desired state Joint Force. PAS' benefits, such as providing detailed assessment tailored to specific assets in theater, solely focus on and support SOCOM's requirements. Additionally, since it possesses no or limited organic field collection capability of its own, PAS is reliant on the availability of external sociocultural data, which it currently pulls from historical and contemporary publications and intelligence reports. This type of data mining is research intensive, requires filtering for relevancy, and is often outdated and requires extensive validation. While PAS offers a unique analytical capability, by integrating it with existing and potential sociocultural data collection assets, PAS could better support the greater sociocultural requirement.

While concepts and intent have been well-defined, capabilities continue to lag behind the desired shift to improved strategic performance. This sentiment is mirrored in Golinghorst's assessment on mapping the human terrain where he states, "The consensus is clear that a comprehensive understanding of culture and the human terrain is necessary but the means to get there seems to be still in dispute."³⁶ By analyzing the desired state and the resulting requirements and by analyzing actual capabilities, a sociocultural gap is apparent between the desired and actual states.

³⁵ Ronald Fry, "USSOCOM Pattern Analysis Section Scope and Purpose" (presentation, USSOCOM, Tampa, FL, December 4, 2014).

³⁶ Golinghorst, *Mapping the Human Terrain in Afghanistan*, 26.

D. RESULTING GAP

“There is perhaps no knowledge guild more insular and less aware of human cultural variations and interconnectedness than military and security studies.” —Dr. Siamak Naficy, *Of Culture and Cliche’: Politics and the Uses (and Abuses) of Anthropology*

Through the analysis in the previous sections, it is evident that a sociocultural gap exists between the DOD’s desired state and its actual state of capabilities (see Figure 1). This gap directly impacts the DOD’s ability to support the greater national policy and to follow strategic guidance of achieving success through people. Highlighting this greater sociocultural requirement and subsequent gap back in 2011, the Joint Urgent Operational Needs Statement (JUONS) to the Office of the Secretary of Defense (OSD) stated the DOD lacked the required “sociocultural expertise, understanding, and advanced automated tools to conduct in-depth collection, consolidation, visualization, and analysis of the operationally relevant sociocultural factors for the battle space.”³⁷ This previously identified gap persists today due to continued disjointed initiatives and the failure to integrate sociocultural knowledge into military planning and operations. The OSD reports the “DOD has established overwhelming evidence documenting the need and requirement for sociocultural capabilities in future full spectrum operations”; yet, the DOD still struggles to incorporate cultural insight into its planning and operations.³⁸

³⁷ U.S. Army, *Human Terrain System*, 4.

³⁸ Ibid.

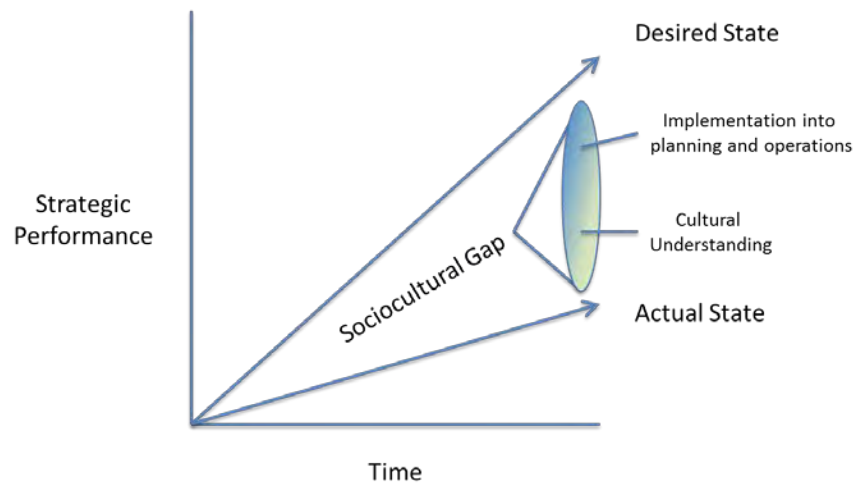


Figure 1. Graphical depiction highlighting the existing DOD sociocultural gap identified by the gap analysis

Three main DOD shortcomings can be inferred from this sociocultural gap: a disjointed array of resources, limited availability of relevant sociocultural data, and the absence of an enterprise solution for data management.

The first shortcoming is a disjointed array of resources of military service, branch and theater specific initiatives, and tactics, techniques, and procedures (TTP) intended to map the human domain. It is important to note that, individually, none of these current initiatives provides a viable enterprise solution. It is only through the unity of effort, which is “not accomplished overnight but in a stepped process,” that the DOD and its decision makers can collectively better understand and influence populations.³⁹ Disjointed resources go beyond the niche human terrain initiatives, but also speak to the persistent disconnect and loss of invaluable sociocultural information during reliefs and unit rotation. DOD service members spend a considerable amount of time and resources becoming subject-matter experts on the relevant human domain in their area of operation (AO) only to redeploy taking that contextual knowledge with them.⁴⁰ The resulting

³⁹ Alexei J. Gavriel, “Incorporating Cultural Intelligence into Joint Intelligence: Cultural Intelligence and Ethnographic Intelligence Theory,” in *Culture, Conflict, and Counterinsurgency*, ed. Thomas H. Johnson and Barry S. Zellen (Stanford, CA: Stanford University Press, 2014), 21.

⁴⁰ Thomas H. Johnson and Barry S. Zellen, ed., *Culture, Conflict, and Counterinsurgency* (Stanford, CA: Stanford University Press, 2014), 12.

requirement from this deficiency is to develop a means by which the sociocultural knowledge achieved by these niche initiatives and current force projection can be assimilated into a unified solution beyond their immediate, local audiences.

The second shortcoming, limited availability of relevant sociocultural data, encompasses the current lack of access to or means to collect timely and relevant data to adequately develop a sociocultural understanding of the operating environment. Mark Herbert provides a snap shot of the current frustration with this DOD shortcoming stating, “we must break free from the familiar think tanks and perfunctory advice from complacent experts regurgitating thread-worn theories and statistics. Instead, we must bring new fields of knowledge and information that draw upon diverse experiences and data sets.”⁴¹ Currently the DOD relies on select niche initiatives, developed regional expertise, and data mining of academic and military publications to produce the required sociocultural data sets.

The issue with this practice is that it severely limits the pool of active collectors, which in turn hinders the frequency, volume, and validation of their data. While the format and usability of the information are important factors impacting the data’s inclusion into a collective solution, frequency and volume enable the overall dataset to remain dynamic and verifiable.⁴² Additionally, “access to precise, accurate, and relevant data” is a highly desirable capability for a sociocultural data sensor.⁴³ As noted with HTS, the lack of access to updated, relevant data significantly degraded their ability to meet the mission. “Analysts seek to develop an understanding of the salient issues that are relevant to both the population and the tactical commander”; therefore, this relevancy impacts the decision of who collects the data as well as what data is ultimately

41 Mark Herbert, “The Human Domain: The Army’s Necessary Push toward Squishiness,” *Military Review* (Sept–Oct 2014): 83.

42 McFate, *Anthropology and Counterinsurgency: The Strange Story of their Curious Relationship*, 29.

43 Erik B. Eldridge and Andrew J. Neboshynshky, “Quantifying Human Terrain” (master’s thesis, Naval Postgraduate School, 2008), 56; Gavriel, “Incorporating Cultural Intelligence into Joint Intelligence: Cultural Intelligence and Ethnographic Intelligence Theory,” 27.

collected.⁴⁴ A three-year ethnographic emic study of a population's culture would be demanding of resources, permissibility, and time and yet may produce zero cultural data that is relevant to military operations. While a documented observation during a patrol may provide relevant cultural data, a patrol report's lack of contextual knowledge could inhibit sociocultural understanding of the environment. When assessing options to address this deficiency, recent research into quantifying human terrain concluded "Organic human terrain collection ability is the only way to provide the DOD with unfettered access to human terrain data."⁴⁵ In light of the aforementioned, the resulting requirement from this shortcoming is to identify additional organic sources within the DOD that can provide relevant, structured, accessible, and verifiable sociocultural data.

The final shortcoming, absence of an enterprise solution to data management, speaks to the lack of ability to currently collect, aggregate, and share sociocultural data across all services and agencies within the DOD. This lack of an enterprise solution exacerbates the previous two shortcomings by further isolating the limited data already collected by the disjointed and uncoordinated initiatives. Due to the pervasive and compounding impact of this shortcoming, recent literature evaluating the human domain and the military's understanding of sociocultural factors is replete with calls for a centralized and collaborative data management solution. One of the three broad sociocultural requirements that emerged from the HTS 2011 initiative was *Info Management* stating, "The Army and DOD require the capability to gather, store, aggregate, process, analyze, visualize, produce and share sociocultural information."⁴⁶ In *Mapping the Human Terrain in Afghanistan*, Golinghorst concludes the main reason for the lack of progress in better understanding the human terrain is due to the stove piping of disjointed initiatives and lack of even a concerted service solution, let alone a DOD

44 Jonathan K. Alt et al., "Population in an Irregular Warfare Environment: The Cultural Geography Model: Evaluating the Impact of Tactical Operational Outcomes on a Civilian," *Journal of Defense Modeling and Simulation: Applications, Methodology, Technology* 6, no. 4 (2009): 186.

45 Eldridge and Neboshynshky, *Quantifying Human Terrain*, 63.

46 U.S. Army, *Human Terrain System*, 5.

solution.⁴⁷ Addressing this shortcoming, he calls for a unity of effort in understanding the human terrain, including “a standardization of the collection, storage, and access to centralized repositories of ethnographic, cultural information accessible to all organizations.”⁴⁸ Similarly, a recently published 2014 *Small Wars Journal* article confirms, “an enduring and Joint (between services) program focused at the operational and strategic level has not been developed...cultural knowledge needs to be obtained and stored at higher command echelons for lower (or subordinate) commands to utilize.”⁴⁹ As pointed out with the first shortcoming, the sociocultural data must be assimilated into a greater solution beyond its original audience in order to enable the DOD to best understand and influence the population. The resulting requirement from this shortcoming is to develop a common framework around which a centralized repository can be built, ultimately unifying the collection, aggregation, and sharing of sociocultural data within the DOD enterprise.

Together, these three shortcomings within the current DOD enterprise—the disjointed array of resources, limited availability of relevant sociocultural data, and the absence of an enterprise solution to data management—comprise the aforementioned sociocultural gap. From these deficiencies, three broad requirements shape the recommendations and subsequent development of a solution to the identified sociocultural gap.

E. IMPLICATIONS

The implications of this gap must be further refined in order to scope any final recommendations. As concluded earlier, a sustainable global security environment hinges on the people; therefore, people—the human domain—are a strategic imperative to the success of the U.S. national, defense, and military strategies. The first thing to infer from this statement is that “cultural knowledge is useful at all levels, strategic down to

⁴⁷ Golinghorst, *Mapping the Human Terrain in Afghanistan*, 44.

⁴⁸ Ibid., 5.

⁴⁹ Lawton, *How the Military Intelligence Community has Failed to Incorporate Sociocultural Understanding of their Operational Environment*, 6.

tactical.”⁵⁰ From the planning and conducting of campaigns, operations, and tactical missions, understanding the human terrain is paramount to the success of today’s expeditionary forces; therefore, the implications of this persistent sociocultural gap span the entire DOD enterprise.

At the strategic level, it is important to note that today “countries are linked through numerous cultural, economic, military, and political ties, not to mention transnational corporations and nongovernmental organizations, and international agencies.”⁵¹ These ties interconnect people from around the globe in a cryptic and multifaceted way. By not possessing the required collective sociocultural understanding, the DOD could fail to decipher the context required to build meaningful foreign partnerships, shape the global security environment, and produce a sustainable strategic win, ultimately falling victim to its own misinformed ethnocentric assumptions. Conversely, McFate argues, “political policy and military operations based on partial and incomplete cultural knowledge are often worse than none at all.”⁵² While as sensational as it may seem, underestimating the power of the underlying sociocultural values and the mobilization of a population has historically led to a strategic failure and the fall of states and Empires.⁵³ This leaves only one strategically viable solution: the DOD must possess a comprehensive sociocultural understanding and incorporate it into its military planning and operations to achieve strategic success.

At the operational echelons, the implications of the sociocultural gap can be seen in the planning phase. Commanders lack the requisite sociocultural understanding of their operating environment, which in turn degrades their ability to properly employ existing planning and operational frameworks, such as political, military, economic, social,

50 Gavriel, “Incorporating Cultural Intelligence into Joint Intelligence: Cultural Intelligence and Ethnographic Intelligence Theory,” 22.

51 Sean F. Everton, *Disrupting Dark Networks* (New York: Cambridge University Press, 2012), 107.

52 McFate, *Anthropology and Counterinsurgency: The Strange Story of their Curious Relationship*, 24.

53 Eldridge and Neboshynshky, *Quantifying Human Terrain*, 15.

infrastructure, information, physical environment, and time (PMESII-PT);⁵⁴ areas, structures, capabilities, organizations, people, and events (ASCOPE);⁵⁵ and diplomatic, information, military, and economic (DIME).⁵⁶ This in turn significantly increases the potential for unintended consequences that could negatively affect the operational and greater strategic success.

At the tactical echelons, the sociocultural gap can “exacerbates insurgencies, generate negative public opinion, and endanger locals and troops.”⁵⁷ By discounting or misunderstanding the sociocultural context surrounding a tactical mission, commanders leave themselves susceptible to their own bias and misperceptions of the target population. Un-contextualized action, while perhaps not immediately impeding tactical victory, can negatively impact the residual operational and or strategic wins over time.

F. RECOMMENDATIONS

“Anthropologists busied themselves with all the minutiae of obscure trial and personal practices...resulted in a large number of painstaking and often accurate records of interesting habits and practices, of such length that no one had time to read them and [which were] often, in any case, irrelevant.” —Sir Philip E. Mitchell

Based on the gap analysis, identified shortcomings, and the subsequently derived sociocultural requirements, several recommendations can be concluded. First, the DOD needs to seek out additional means by which to gain access to and to collect relevant sociocultural data. Having access to relevant sociocultural data is critical in building the necessary understanding of a population and the operating environment to achieve a strategic win. As succinctly depicted by this 1951 quote, Sir Philip E. Mitchell captures the sentiment of previously failed attempts to fuse ethnographic studies into military

⁵⁴ Department of the Army, *Operations* (FM 3-0) (Washington, DC: Government Printing Office, February 2008), 1–5.

⁵⁵ Department of the Army, *Tactics in Counterinsurgency* (FM 3-24.2) (Washington, DC: Government Printing Office, April 2009), 1–8.

⁵⁶ U.S. Joint Chiefs of Staff, *Civil-Military Operations* (JP 3-57) (Washington, DC: U.S. Joint Chiefs of Staff, September 11, 2013), IV-5.

⁵⁷ Montgomery McFate, “Does Culture Matter? The Military Utility of Cultural Knowledge,” *Joint Forces Quarterly* (JFQ) 28, no. 38 (2005): 43.

operations.⁵⁸ Sociocultural data alone is not enough; it must also be relevant, discoverable, and presented in such a manner that it is consumable by decision makers. Currently, SOF possesses the largest pool of potential collectors of such data; however, there is no standardized debriefing or collection mechanism by which to collect and share the data across the force. While SOF's cultural and linguistic expertise lends to their access and credibility of the information, SOF also compartmentalizes the data—ultimately limiting any beneficial transfer and sharing of sociocultural understanding to the greater Joint Force. As for the HTS and PAS capabilities, they currently both lack the personnel, resources, and permissibility to the areas of interest to collect the data organically. In addition to increasing the collection footprint by mere number of collectors, the footprint also needs to be expanded to better support all phases of the Joint Phasing model. By instituting a DOD-wide collection mechanism for sociocultural data, the DOD could significantly broaden its collection footprint enabling service members from across the force to provide insight gleaned from their exposure to or expertise on a population or operating environment regardless of their phase of operation, echelon, or service. This crowdsourcing method of collecting information allows for the decentralization of sociocultural data submission from the traditional reporting stove pipes, enabling the rapid access, verification, validation, and sharing of the data throughout the enterprise.

Second, the DOD needs a singular repository for the collected sociocultural data. This review of current concepts and capabilities has demonstrated that while the demand for a comprehensive understanding of the human domain is present, there are minimal ways or means by which insights gained within the DOD are collected, visualized and shared between the individual command echelons. Those with access and expertise to the populations remain disjointed from those who would analyze the data, and still further removed from the decision makers that would integrate the sociocultural knowledge into planning and operations. Despite DOD's efforts toward “building ‘culture maps’ that

⁵⁸ Philip E. Mitchell, “Review of Native Administration in the British Territories in Africa,” *Journal of African Administration* 3 (1951): 56–57.

include details such as region's tribal affiliations, ethnicity, religion and language," the DOD still requires a solution that can enable its forces to collect, visualize, and share the necessary sociocultural data.⁵⁹

By implementing a centralized living repository within the DOD, a potentially real-time sociocultural record of a population could be generated allowing for a singular focal point to dynamically track a populations' previous, current, and emerging sociocultural identities and behavior. This method contrasts the current static reporting procedures and repositories where the data is isolated prohibitive of any dynamic interaction or analysis. Through the use of a living repository, where the data is continually correlated, updated, and validated by the users, a contextually rich and interconnected understanding of a population can be achieved. Additionally, "it is becoming ever more difficult to calculate the effects of any action, as increasing interconnectedness multiplies the number, scale and speed of second, third, and fourth order effects."⁶⁰ Through the use of this enterprise wide and interconnected sociocultural living repository, the DOD will be best prepared to match this speed and scale through the collaborative and relevant collection and exchange of pertinent population data.

Last, the DOD needs a unified way in which to synchronize the Joint Force's efforts in regards to achieving a sociocultural understanding and implementation of that understanding into military planning and operations. While the aforementioned recently released concepts provide the ends, the stated ways continue to remain disjointed and underdeveloped throughout the DOD. As noted earlier, the Strategic Landpower Task Force has primacy over unifying the three land-based components of the DOD, yet no common framework has been implemented between them, let alone the rest of the DOD. The implementation of this common framework is a critical first step in synchronizing the greater Joint Force. Due to the complexity of the human domain, the desire for a

⁵⁹ Grace V. Jean, "'Culture Maps' Becoming Essential Tools of War," National Defense Magazine, February 2010, accessed April 04, 2015, <http://www.nationaldefensemagazine.org/archive/2010/February/Pages/'CultureMaps'BecomingEssentialToolsofWar.aspx>.

⁶⁰ Strategic Landpower Task Force, *Strategic Landpower: Winning the Clash of Wills*, 6.

whole-of-government approach, and the dynamic security environment, cross-service cooperation and interdepartmental synchronization is now paramount in order to achieve a strategic win. From the collection mechanism, to the indexing, storage, and sharing of the data, to the eventual implementation of the data into military decision making, a common and intuitive sociocultural framework is required.

This framework would directly align with two of the previous recommendations. Once implemented, the efforts of the actual capabilities and the above recommendations become complementary and unified contrasting their currently disjointed state. In addition to the force multiplying power of the common sociocultural framework in terms of collection, visualization, and sharing, the framework will also serve a secondary function of empowering decision makers by resolving any previous confusion and misinterpretation of how to employ the sociocultural data. Merely possessing a sociocultural understanding of the human domain does not assure a “strategic win”; only through its implementation by the Joint Force throughout all phases of the Joint Phasing model will the DOD begin to advance toward its desired state.⁶¹ Through the implementation of these recommendations, the DOD will have the ways and means to achieve an enterprise solution to the problem of identifying, understanding, prioritizing, integrating and influencing the human domain in respect to military operations, ultimately bridging the identified sociocultural gap and better enabling the strategic win.

⁶¹ David Perkins, “Army Wide Changes and the New Army Operating Concept” (presentation, Naval Postgraduate School, Monterey, CA, December 09, 2014).

III. ANALYTIC FRAMEWORK

Revealed through the use of the aforementioned gap analysis and highlighted by the identified three DOD shortcomings—a data gap, a repository gap, and a collaboration gap, sociocultural data alone is not enough to bridge the gaps; it must also be relevant, contextual, discoverable, and shared in such a manner that it is consumable by decision makers across the Joint Force. Only then can sociocultural data be transformed into a greater DOD sociocultural understanding and “potentially determine if a planned military action will be welcomed with cheers or bullets.”⁶² To accomplish this, the terms sociocultural understanding and culture, to include its main components—sociocultural factors and behavior—are defined and their causal relationship modeled. The resulting structured causality provides insight into the data that is both necessary for and pertinent to military operations. The data is then cataloged using the *Five Operational Culture Dimensions* model, which serves as the sociocultural ontology.⁶³ This intuitive ontology enables the collection, indexing, storage, and sharing of the relevant data for implementation into the decision making cycle, ultimately achieving the greater Joint Force’s dynamic and collaborative sociocultural living repository.

A. SOCIOCULTURAL UNDERSTANDING DEFINED

“There is no single, uncontested definition of culture.” —International Federation of Red Cross and Red Crescent Societies

Similar to recent attempts to define the amorphous term ‘information warfare,’ the term culture has thwarted the best attempts by academia and the military to agree on any universally acceptable definition.⁶⁴ In lieu of this, the proposed framework takes a pragmatic approach at examining the terms culture and sociocultural understanding and their application to military operations, decision makers, and the greater nation’s strategic

⁶² Eldridge and Neboshynshky, *Quantifying Human Terrain*, 30.

⁶³ Salmoni and Holmes-Eber, *Operational Culture for the Warfighter: Principles and Applications*, 15.

⁶⁴ Martin Libicki, *What is Information Warfare?* (Washington, DC: National Defense University, 1995); Johnson and Zellen, *Culture, Conflict, and Counterinsurgency*, 6.

performance. This approach results in the identification of two main components with direct relevancy to DOD operations: sociocultural factors and the resulting behaviors. Each of these components is necessary but not sufficient in achieving a holistic sociocultural understanding of a population.⁶⁵ Furthermore, understanding the causal loop relationships between the two is integral to understanding, implementing, and translating the garnered sociocultural knowledge into improved strategic performance.⁶⁶

Between academia and the military a great divergence exists as to what exactly the term “culture” encompasses.⁶⁷ However, despite this theoretical quandary, it is important to note before further examination that people are not randomly walking about; they are enabled and constrained by their surrounding context and structure.⁶⁸ Context and structure establish the precedents that shape the nature of culture. Within academia, the anthropological field tends to possess the broadest and most inclusive interpretation of what constitutes culture,⁶⁹ while the field of economics tends to define culture more narrowly in an effort to better identify cultural impact on economics,⁷⁰ and finally the psychological field tends to focus on the resulting behavior imbued by culture and their mutually constitutive relationship.⁷¹ Similarly, the DOD also demonstrates an uncertainty and vagueness as to the definition of culture, often varying from publication to

⁶⁵ Department of the Army, *Insurgencies and Countering Insurgencies* (FM 3-24), 3–6.

⁶⁶ Magoroh Maruyama, “Causal Loops, Interaction, and Creativity,” *International Review of Sociology: Revue Internationale De Sociologie* 13, no. 3 (2003): 607.

⁶⁷ Johnson and Zellen, *Culture, Conflict, and Counterinsurgency*, 6.

⁶⁸ Jonathan H. Turner, *Sociology* (Upper Saddle River, NJ: Pearson Prentice Hall, 2006), 88.

⁶⁹ “Shared patterns of ideas and behaviors...” defined by Gavriel, “Incorporating Cultural Intelligence into Joint Intelligence: Cultural Intelligence and Ethnographic Intelligence Theory,” 20; derived from Daniel G. Bates and Fred Plog, *Cultural Anthropology*, 2nd ed. (New York: Alfred A. Knopf, 1980); “Culture is a “system” consisting of “inputs,” “outputs,” and “throughputs.”” defined by Johnson and Zellen, *Culture, Conflict, and Counterinsurgency*, 242.

⁷⁰ Defines culture “as those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation.” Luigi Guiso, Paola Sapienza and Luigi Zingales, “Does Culture Affect Economic Outcomes?” *The Journal of Economic Perspectives* 20, no. 2 (Spring, 2006): 2.

⁷¹ Culture is “the normative system and values that people use as guides to their behavior...” defined by Fathali M. Moghaddam, *Multiculturalism and Intergroup Relations: Psychological Implications for Democracy in Global Context* (Washington, DC: American Psychological Association, 2008), 23.

publication.⁷² This inability to bound culture within a generally-accepted and shared theoretical concept continues to compound the need for a common framework from which to bridge the sociocultural gap; yet, amidst the variation and interpretations the notion of culture as shared variables and behaviors among a social group remains consistent. What those variables are, the role of each, and the relational impact between the variables and behavior are generally where the divergence occurs. By removing the divergent points of contention, this proof of concept posits culture as a shared system of interrelated factors and behaviors to serve as the foundational definition and a departure point for further examination.

Building on this understanding of culture, it is evident that in order to facilitate the establishment and implementation of a sociocultural understanding, the proposed framework must account for the two main identified components of culture—the sociocultural factors and behaviors—as well as the causal relationship between the two as shown in Figure 2. The first component, sociocultural factors, refers to the combination of both social and cultural factors impacting human behavior within a given space and time, often referred to within the military as the ‘Human Terrain.’⁷³ This component is comprised of “a set of complex, ever-changing, and interconnected social, historical, political, and environmental factors that shape the perceptions, motives, and behaviors of its population.”⁷⁴ Specifically, the existing sociocultural factors directly impact the overall culture system, serving as an independent variable or “anchor point” from which one’s identity is determined and ultimately used to shape the resulting action—human behavior—of the individual, group, or population.⁷⁵ This distinct combination of sociocultural factors’ impact, while directly causal to the behavior, remains subject to the

⁷² “Culture is a web of meaning shared by members of a particular society or group within a society.” Defined by Department of the Army, *Insurgencies and Countering Insurgencies* (FM 3-24), 3-3.

⁷³ Eldridge and Neboshynshky, *Quantifying Human Terrain*, 19.

⁷⁴ Department of the Army, *Insurgencies and Countering Insurgencies* (FM 3-24), 8-4.

⁷⁵ Steffen Merten, “Employing Data Fusion in Cultural Analysis and COIN in Tribal Social Systems,” in *Culture, Conflict, and Counterinsurgency*, ed. Thomas H. Johnson and Barry S. Zellen (Stanford, CA: Stanford University Press, 2014), 85; Richard Tapper, “What is ‘Afghan Culture’? An Anthropologist Reflects” (School of Oriental and African Studies, University of London, The Anthony Hyman Memorial Lecture, 2008); UN Development Programme, *Afghanistan: National Human Development Report 2004*, ed. Nancy H. Dupree (UNDP, 2004), 233.

individual or group's retained degree of agency to make decisions.⁷⁶ Due to the role sociocultural factors play in the overall shared system, accurately identifying, collecting, and sharing this data are paramount in beginning to develop an understanding of the greater population.

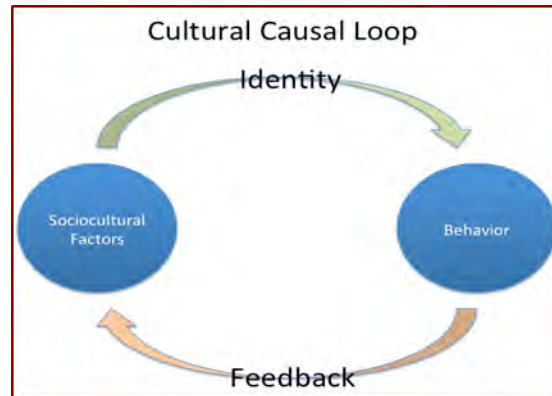


Figure 2. Proof of concept culture model depicting the necessary sociocultural components to achieve a cultural understanding⁷⁷

The second component, behavior, as previously noted, is formally and informally interrelated with and influenced by the existing sociocultural factors within the given temporal and geospatial extent. Behavior serves as the dependent variable within the group's greater culture or shared system. This interrelation with the existing sociocultural factors is direct in nature and governed by the accepted identity of the individual or group. The resulting behavior of this causal relationship is an end manifestation of the existing sociocultural factors, the accepted identity, and their degree of agency. These resulting behaviors in turn directly impact and reshape the existing sociocultural factors via a causal feedback loop. Just as evolutionary theory indicates that natural selection,

⁷⁶ Gavriel, "Incorporating Cultural Intelligence into Joint Intelligence: Cultural Intelligence and Ethnographic Intelligence Theory," 20.

⁷⁷ Derived from the following works: Department of the Army, *Insurgencies and Countering Insurgencies* (FM 3-24), 3-4; Helen Spencer-Oatley, *What is Culture? A Compilation of Quotations* (Warwick: University of Warwick, 2012), 4; Salmoni and Holmes-Eber, *Operational Culture for the Warfighter: Principles and Applications*, 15; Gavriel, "Incorporating Cultural Intelligence into Joint Intelligence: Cultural Intelligence and Ethnographic Intelligence Theory," 20; Johnson and Zellen, *Culture, Conflict, and Counterinsurgency*, 242.

mutation, and inheritance are necessary, cultures—and therefore sociocultural factors—survive through the process of evolution; they develop, adjust, or terminate.⁷⁸ This dynamic relationship is highlighted by GEN Petraeus’s comments stating that the Afghans “are notorious for changing the form of their social organization [sociocultural factors] when they are pressured by internal dissension or external forces.”⁷⁹ Due to the fact this causal feedback loop serves a critical role in the viability of the overall shared system, its context must be collected, stored, and shared along with the component data in order to establish a comprehensive sociocultural understanding.

Similar to how social, political, and infrastructure operational variables are fundamental to understanding an operational environment, sociocultural variables, behaviors, and their interrelationships are fundamental to a comprehensive sociocultural understanding and ultimately to bridging the sociocultural gap.⁸⁰ The culture model provides insight for crafting the narrative prompts used later in the proof of concept to solicit service member narratives tailored to identifying the population’s cultural identities. Culture is a system starting with a set of shared sociocultural factors that “forms the basis of how people interpret, understand, and respond to events and people around them.”⁸¹ This basis is dependent on the learned sociocultural factors, accepted identity, and degree of individual agency, ultimately resulting documentable behavior. Based on this, understanding which identities are prevalent at which times and situations is directly relevant to the conduct of military operations and the greater desired state of improved strategic performance.⁸² As noted in *Quantifying Human Terrain*, “if patterns of behavior and their underlying meanings can be deciphered, predictive analysis can be

⁷⁸ Derived from Tyrrell, “The use of Evolutionary Theory in Modeling Culture and Cultural Conflict,” 47.

⁷⁹ The Security Crank, “Petraeus Quietly Disses ‘Human Terrain.’”

⁸⁰ Department of the Army, *Operations* (FM 3-0), 1-22.

⁸¹ Department of the Army, *Insurgencies and Countering Insurgencies* (FM 3-24), 3-1.

⁸² Department of the Army, *Insurgencies and Countering Insurgencies* (FM 3-24), 3-12; Eldridge and Neboshynshky, *Quantifying Human Terrain*, 30.

conducted with greater confidence in future events,” further enhancing the DOD’s decision making capability concerning the human terrain.⁸³

B. ONTOLOGY

The stated cultural model drives the collection requirements by identifying the necessary sociocultural data from which to establish and implement an understanding within the DOD. In order to bridge the sociocultural gap, the data must be cataloged uniformly using an intuitive ontology, an imperative when discussing data collection and sharing. Figures 3 and 4 show Salmoni and Holmes-Eber’s *Five Operational Culture Dimensions* model, providing the foundational structured ontology, around which the proof of concept is further developed. As the “*Operational Culture*” concept was designed with the military already in mind, its structure incorporates the different broad dimensions of culture necessary for planning and executing military operations.⁸⁴ The ontology provides an anthropologically sound structural framework and common language that allow for a universal conceptualization of the data components and their relationships within the cultural system.⁸⁵ Using this hierarchic structured relationship, sub-factors are further identified and added demonstrating the infinite inclusive potential of the overall enterprise solution. Together they effectively provide a means by which to begin to structure, correlate, and share the data. As noted by *Sociocultural Data to Accomplish Department of Defense Missions: Toward a Unified Social Framework*, “the most effective way to use models of sociocultural knowledge and behavior is not as ‘stand-alone problem solving technologies’ but rather as part of a broader effort to understand human behavior, in which the models are used to offer insights, trigger ideas, and generate new stories as a way of aiding decisions and judgments by humans.”⁸⁶ By

⁸³ Eldridge and Neboshynshky, *Quantifying Human Terrain*, 28.

⁸⁴ Defined as “Those aspects of culture that influence the outcome of a military operation, conversely, the military actions that influence the culture of an area of operations.” by Salmoni and Holmes-Eber, *Operational Culture for the Warfighter: Principles and Applications*, 7.

⁸⁵ *Ibid.*, 15.

⁸⁶ Robert Pool, *Sociocultural Data to Accomplish Department of Defense Missions: Toward a Unified Social Framework* (Washington, DC: The National Academies Press, 2011), 2.

using a common language to uniformly structure the necessary data, the proof of concept provides a solution to the gap analysis's third recommendation—synchronize the Joint Force's efforts—from collection of the data, to the indexing, storage, and sharing of the data, to the eventual implementation of the data into military decision making.

Models and the Explanation of Conflict		
1	Ecological	War is related to battles over limited resources.
2	Social Structure	Conflict results from vying plays for power in an unequal social structure.
3	Symbolic	War is an inevitable conflict over identity and ideology between competing systems.

Figure 3. Three Pillars of the Thinking and Planning Framework for Operational Culture⁸⁷

⁸⁷ Salmoni and Holmes-Eber, *Operational Culture for the Warfighter: Principles and Applications*, 24.

From Anthropological Models to Operational Culture Dimensions	
Ecological Model	
Dimension 1: The Physical Environment	The way that a cultural group determines the use of the physical environment. Who has access to important physical resources (water, land, food, building materials etc.) and how the culture views these resources (e.g. land is owned or free to everyone).
Dimension 2: The Economy	The way that people in a culture obtain, produce and distribute physical and symbolic goods (whether food, clothing, cars or cowrie shells).
Social Structure Model	
Dimension 3: The Social Structure	How people organize their political, economic, and social relationships, and the way this organization influences the distribution of positions, roles, status, and power within culture groups.
Dimension 4: The Political Structure	The political structures of a culture group and the unique forms of leadership within such structures (bands, acephalous societies, councils, hereditary chiefdoms and tribal structures, electoral political systems etc.). The distinction between formal, ideal political structures versus actual power structures.
Symbolic Model	
Dimension 5: Beliefs and Symbols	The cultural beliefs that influence a person's world view and the rituals, symbols and practices associated with a particular belief system. These include also the role of local belief systems and religions in controlling and affecting behavior.

Figure 4. Five specific Cultural Dimensions of the battlespace for examination and incorporation into planning and execution and their relation within the Three Pillars of Thinking and Planning Framework⁸⁸

C. RELEVANT DATA

With the necessary data elements understood and a sociocultural framework established, the enterprise solution now requires a viable source of data as outlined in the gap analysis's first recommendation—additional means by which to gain access to and collect relevant sociocultural data. This proof of concept posits that the source of the sociocultural data is an existing yet untapped resource of the DOD: its personnel. DOD personnel have access, by nature of their profession, to a multitude of relevant sociocultural data spanning the global population. SOCOM alone has “on an average day, Special Operation Forces (SOF) [operating] in 78 countries working to build partner

⁸⁸ Salmoni and Holmes-Eber, *Operational Culture for the Warfighter: Principles and Application*, 25.

capacity.”⁸⁹ This operational cultural knowledge base remains untapped, yet is vital to decision makers due to its insights into the aspects of culture that impact operations, as well as, how military operations impact an existing culture.⁹⁰ Across the force, the DOD maintains either an episodic or persistent presence throughout much of the globe, “with every additional node in the human network...add[ing] an exponential understanding of the problem area.”⁹¹ This access enables data to be collected, validated, and updated near real time by a variety of sources allowing for a more comprehensive sociocultural understanding.

Additionally, because of the nature of the source—falling directly under the DOD and its authorities—the common framework can be employed in a holistic fashion, unifying the efforts of the greater Joint Force. As addressed during the gap analysis, while SOF personnel are uniquely adapted to serve in this capacity, the aperture must remain open to the entire force in order to maximize access, collection potential, and variety of the data collected. By broadening out the collection to the greater force, the proposed enterprise repository is better suited to gather and support all phases of the Joint Phasing model, vice current capabilities’ myopic focus on Phase III and IV operations. This wellspring of relevant sociocultural data provides both contextually rich quantitative and qualitative data that support all levels and phases of military operations.

D. SERVICE MEMBER NARRATIVE

By establishing the source of the required sociocultural data—DOD personnel—the proof of concept captures and transmits the data in such a way as to preserve the components of the culture model and the contextual causal loop. Narrative prevails as the best medium to transfer such critical elements; through its distinct features, narrative possesses the ability to “tell people what to expect in various situations so that the listener

⁸⁹ Yoho, “The Global SOF Network and the Global Special Operations Campaign Plan.”

⁹⁰ Jack D. Eller, *From Culture to Ethnicity to Conflict: An Anthropological Perspective on International Ethnic Conflict* (Ann Arbor, Michigan: The University of Michigan Press, 1999), 15.

⁹¹ Caludette Roulo, “McRaven: Success in Human Domain Fundamental to Special Ops,” American Forces Press Service, June 5, 2013, accessed December, 15, 2014, <http://www.defense.gov/news/newsarticle.aspx?id=120219>.

can benefit from the experience without having to go through it personally.”⁹² Combining the source pool of service members with the capabilities of narrative, the proof of concept creates a unique data set—Service Member Narrative—built around the stories of service members’ observations and experiences garnered through interaction with other cultures.

As “man is...essentially a story-telling animal,” service members can effortlessly convey their sociocultural knowledge by developing, expressing, and sharing their own narratives, or stories.⁹³ Service members’ natural and inherent ability to converse will provide service member narratives capable of delivering coherent sociocultural material with a level of data richness and depth of information not feasible through rigidly-formatted reporting systems. Additionally, narrative acts as an integral part of comprehending sociocultural data: “narrative can not be understood apart from history and culture.”⁹⁴ Conversely, history and culture cannot truly be understood apart from narrative due to their mutually constituting relationship. This proof of concept relies on the use of service member narratives to preserve the context behind a displayed cultural trait, allowing one to recognize and understand the causal relationship between sociocultural factors of a population and the resulting behaviors, as shown in Figure 5. This breadth of context is what formulates narrative as an optimal medium by which to transmit sociocultural information, reinforced by its capacity to expose and interpret the two components—sociocultural factors and the resulting behaviors—necessary in establishing and implementing sociocultural understanding across the Joint Force. Without narrative, the ability to collect, convey, and preserve sociocultural observations comprised of cultural trait’s influence to society would suffer.

⁹² Pool, *Sociocultural Data to Accomplish Department of Defense Missions: Toward a Unified Social Framework*, 65.

⁹³ Alasdair MacIntyre, *After Virtue: A Study in Moral Theory* (1981): 201, quoted in Walter R. Fisher, “Narration as a Human Communication Paradigm: The Case of Public Moral Argument,” in *Contemporary Rhetorical Theory: A Reader*, ed. John Louis Lucaites, Celeste Michelle Condit and Sally Caudill (New York: The Guilford Press, 1999), 266.

⁹⁴ Donileen R. Loseke, “The Study of Identity as Cultural, Institutional, Organizational, and Personal Narratives: Theoretical and Empirical Integration,” *The Sociological Quarterly* 48, no. 4 (Fall 2007): 673.

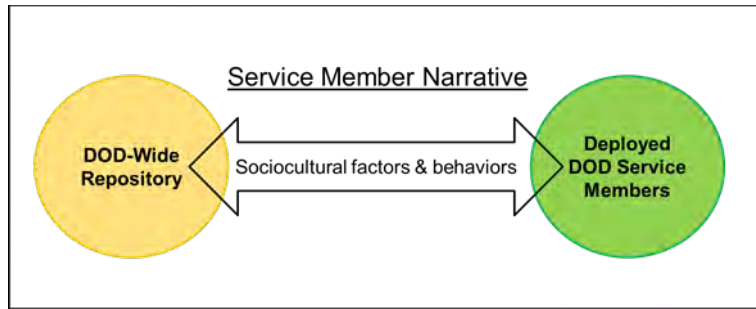


Figure 5. Proof of concept service member narrative model depicting the transmission of the sociocultural components through service members’ shared stories

With the focal point centered on the sociocultural categories and variables built through the sociocultural ontology, the proof of concept applies the self-administered questionnaire approach to enhance the development, expression, and sharing of service member narratives. This concept, combined with the capabilities of the Internet and lightweight web and mobile clients, allows “data [to] be collected in places where respondents go...by having respondents answer questions into computers” or comparable systems.⁹⁵ This capability is critical as DOD maintains and continues to expand its global footprint. While DOD’s expansion presents various challenges to the ease of collecting and capturing operational sociocultural knowledge, the self-administered approach provides a common system designed to unify and synchronize the Joint Force’s data collection efforts regardless of the location of operation.

Additionally, the self-administered approach provides several advantages to enhancing the quality of service member narratives and the wealth of information they produce. In order to guide and control the relevancy of sociocultural narratives, the proof of concept divides and categorizes narratives into sub-narratives, mirroring their respective sociocultural factors. With a widespread inclination to misinterpret sociocultural factors and behaviors due to their convoluted definitions, transferring one’s observation into a narrative can pose a challenge. However, the self-administered concept presents “an advantage when question response categories are numerous or complex”;

⁹⁵ Floyd J. Fowler Jr., *Survey Research Methods*, ed. Leonard Bickman and Debra J. Rog, 4th ed. (Thousand Oaks, CA: SAGE Publications, 2009), 69.

this technique offers users to carefully reflect and produce narratives that can become comprehensible, mutually supported by the concept that service members are “storytelling animals.”⁹⁶ Moreover, the proof of concept further simplifies the sub-narrative questionnaire structure to enhance the full potential of the self-administered technique. As the self-administered technique promotes the ability to collect and share complex materials, it also allows the frequent and accurate transmission of masked information exclusively known to a population and of minute details, such as the type of food a population consumes.⁹⁷ This sort of information depth is essential for service member narratives as “it is through narrativity [sic] that we come to know, understand, and make sense of the social world.”⁹⁸

To capitalize on the full potential of the self-administered approach, the proof of concept employs two types of questioning: rating scale and open-ended.⁹⁹ While the rating scale form can ultimately produce visual and quantifiable data of service members’ cultural insights, the open-ended format allows service members to develop, express, and share their stories in a free and natural way.¹⁰⁰ In concert, these different techniques concurrently capture and transmit service member narratives consisting of sociocultural data relevant to military operations.

Through the rating scale mechanism, also known as Likert-type scales, which presents a statement followed by respondents’ choices—such as Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree—the proof of concept provides a system to measure service members’ attitudes, defined as “a general predisposition toward groups

⁹⁶ Floyd J. Fowler Jr., *Survey Research Methods*, 73.

⁹⁷ *Ibid.*, 74–75.

⁹⁸ Margaret R. Somers, “The Narrative Constitution of Identity: A Relational and Network Approach,” *Theory and Society* 23, no. 5 (October 1994): 606.

⁹⁹ H. Russell Bernard, *Research Methods in Anthropology: Qualitative and Quantitative Approaches*, 4th ed. (Oxford, UK: AltaMira Press, 2006), 317; Raymond Kent, *Data Construction and Data Analysis for Survey Research* (New York: Palgrave, 2001), 227.

¹⁰⁰ H. Russell Bernard, *Research Methods in Anthropology: Qualitative and Quantitative Approaches*, 317; Raymond Kent, *Data Construction and Data Analysis for Survey Research*, 227.

of people, organizations, institutions, and so on.”¹⁰¹ By gathering information on service members’ perspectives and attitudes through a rating scale toward proposed topics, the proof of concept is able to frame respondents’ sociocultural observations. Additionally, to ensure that such information is relevant to military operations, this proof of concept incorporates a mechanism for respondents to indicate which phase of the Joint Phasing model the observation stems from; end users then have the option of identifying which phase of the model their narratives reflect. This structure facilitates collection and support beyond the noted HTS’ current focus on Phases II and III. Thus, information is now discoverable based on the phase of operation and collected across all phases of operation by nature of the data source. For example, rating scales can illustrate service members’ thoughts on if a certain sociocultural factor leads a population to grievances, can support future sentiment analysis, and can provide insight into the sociocultural factors evoked by the population to determine its identity. Collecting and transmitting such “attitudes” provide end users with an insight into the identity of the population and the reasoning for its behavior, and this understanding evolves from service members’ sociocultural observations.

Open-ended questions represent a complementary technique to the rating scale mechanism that the proof of concept exercises to enable the transmission of service members’ sociocultural insights through narratives. Although they are “open,” these questionnaires are structured with the goal of amplifying the service member’s observations on the sociocultural factors, behavior, and contextual relationships. The open-ended format provides numerous advantages in assisting in the development, expression, and sharing of service member narratives. By incorporating open-ended questions to collect narratives, the proof of concept allows “respondents to formulate their thoughts in their own words.”¹⁰² With the inherent human skill to story-tell, service members can create narratives, consisting of “rich descriptions and explanations of

¹⁰¹ H. Russell Bernard, *Research Methods in Anthropology: Qualitative and Quantitative Approaches*, 327-328; Mildred L. Patten, *Questionnaire Research: A Practical Guide*, 2nd ed. (Los Angeles, CA: Pyczak Publishing, 2001), 33–34.

¹⁰² Raymond Kent, *Data Construction and Data Analysis for Survey Research*, 227, derived from Matthew B. Miles and A. Michael Huberman, *Qualitative Data Analysis*, 2nd ed. (1994).

processes in identifiable local context.”¹⁰³ Additionally, such narratives developed from open-ended questions “possess an immediacy, an appeal to intuitive understanding that does not necessarily require any further ‘interpretation’ or processing”; thus, this technique allows DOD to capture untapped operational cultural knowledge that its personnel possess.¹⁰⁴ By providing a means for service members to develop and express their narratives through the self-administered approach using both rating scale and open-ended questions, the proof of concept acts as a medium to collect and share narratives among service members, fostering a more comprehensive sociocultural understanding of the environment.

E. WEB-BASED GEOSPATIAL INTERFACE

Using the aforementioned cultural framework and service member narratives as a primary source of sociocultural data, this proof of concept uses a web-based Geographic Information System (GIS) interface to collect, aggregate, display, and share sociocultural data. The reasoning behind choosing a web-based GIS interface to display sociocultural data is threefold: 1) GIS interfaces are both familiar and ubiquitous in the military and across society; 2) web-based geodatabases are powerful and adaptable, capable of fusing narrative and non-narrative data into a single visualization tailored to the cultural model; and 3) cloud computing and advances in information technology have made web-based GIS readily accessible to almost anyone and facilitate populating and validating input data through crowdsourcing. The web-based GIS database is structured with three components: narrative and non-narrative data layers, a web map, and an intuitive user interface. For this proof of concept, data layers derived from multiple sources are hosted on a common server—ArcGIS Online—and arranged according to a hierarchy derived from the *Five Operational Culture Dimensions*, which can be further broken down into variables and their subordinate traits.¹⁰⁵ For example, the data layer “Roads” represents

¹⁰³ Raymond Kent, *Data Construction and Data Analysis for Survey Research*, 228.

¹⁰⁴ *Ibid.*

¹⁰⁵ Environmental Systems Research Institute, “ArcGIS Online - Create Web Maps, Applications, and Data in the Cloud,” accessed April 06, 2015, <http://www.esri.com/software/arcgis/arcgisonline>.

the displayable trait, which falls under the variable “Transportation,” which in turn is a component of the “Physical Environment” dimension. This hierarchy constitutes the data component that can be populated, edited, queried, and displayed within the GIS interface. Web maps provide a common geospatial data picture to all users and “are constructed using data layers from services and files to communicate a specific message or provide specific map-based capabilities.”¹⁰⁶ Web maps can be used by applications, such as JavaScript-based user interface, as an intermediary between data layers and the end user. In order to illustrate the potential of the proof of concept model, Environmental Systems Research Institute (ESRI)—a leader in the field of GIS—built a JavaScript-based custom web application for this capstone, integrating an intuitive interface with sociocultural data from various sources, to include narrative user-generated content. The product of this integration is a practical, dynamic, and collaborative sociocultural living repository, representing a viable enterprise solution for enhancing the Joint Force’s collective cultural knowledge.

GIS interfaces are intuitive even from a biological point of view, as compared to text-based interfaces. Feature-driven reading—recognizing shapes, lines, and patterns—is natural, easily learned, and “built in and therefore automatic from birth,” whereas context-driven reading requires knowing the underlying context in advance.¹⁰⁷ GIS is an interplay between the science of geography—empirically derived quantitative and qualitative data—and the art of cartography—displaying said data to show geospatial and temporal relationships between data.¹⁰⁸

Contributing to the intuitive nature of GIS is the burgeoning popularity of Volunteered Geospatial Information, or VGI. VGI has continued to gain prevalence and familiarity through wikis and gazetteers, as illustrated by popular websites such as

¹⁰⁶ Environmental Systems Research Institute, “What is an ArcGIS Web Map? - ArcGIS Online Help,” accessed May 05, 2015, <https://doc.arcgis.com/en/arcgis-online/reference/what-is-web-map.htm>.

¹⁰⁷ Jeff Johnson, *Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Rules* (San Francisco, CA: Morgan Kaufmann Publishers Inc, 2010), 35.

¹⁰⁸ Francis Harvey, *A Primer of GIS: Fundamental Geographic and Cartographic Concepts* (New York: Guilford Press, 2008), 4.

Wikimapia, Flickr, and OpenStreetMap.¹⁰⁹ This familiarity with VGI allows a group of people to patch together a common understanding, and “given a server with appropriate tools, the various pieces of the patchwork can be fitted together, removing any obvious inconsistencies, and distributed over the web.”¹¹⁰ Thus, the concept of weaving together a patchwork of disparate data is already alive and well and may help weave together the disjointed array of resources, a shortcoming identified in Chapter II. Familiarity with VGI leads to a more time-efficient user experience, allowing a user to focus on the goal—telling his or her story—rather than the tool used to accomplish that goal—the user interface.¹¹¹

The familiarity of the web-based GIS experience extends to a common data format, in this case shapefiles, which are used by the web-based and desktop versions of ArcGIS software suite.¹¹² Data can also be exported into a Comma Separated Value (CSV) file for ingestion into other analytical programs or predictive analysis tools, such as the Athena project.¹¹³ This living dataset can support other forms of structured assessments used by various organizations across the tactical, operational, and strategic levels, such as: political, military, economic, social, infrastructure, information, physical environment, and time (PMESII-PT);¹¹⁴ areas, structures, capabilities, organizations, people, and events (ASCOPE);¹¹⁵ or diplomatic, information, military, economic (DIME).¹¹⁶

¹⁰⁹ Michael F. Goodchild, “Citizens as Sensors: The World of Volunteered Geography,” *GeoJournal* 69, no. 4 (2007): 212–213.

¹¹⁰ Michael F. Goodchild, “Citizens as Sensors: The World of Volunteered Geography,” 217.

¹¹¹ Johnson, *Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Rules*, 97.

¹¹² Michael Law and Amy Collins, *Getting to Know ArcGIS for Desktop*, 3rd ed. (Redlands, CA: ESRI Press, 2013), 79–80.

¹¹³ Robert G. Chamberlain and William H. Duquette, *Athena in 2013 and Beyond* (Pasadena, CA: California Institute of Technology, 2013), 1.

¹¹⁴ Department of the Army, *Operations* (FM 3-0), 1-5–1-9.

¹¹⁵ Department of the Army, *Tactics in Counterinsurgency* (FM 3-24.2), 1-8.

¹¹⁶ U.S. Joint Chiefs of Staff, *Doctrine for Joint Special Operations* (JP 3-05) (Washington, DC: U.S. Joint Chiefs of Staff, 17 December 2003), I-11–I-13.

This project's GIS database is designed to handle a multitude of data types and has the capability to combine qualitative data derived from narratives with quantitative data from various sociocultural factors. The narrative data adds richness and context to the other layers, enhancing the user's understanding of geospatial or temporal relationships between different sociocultural factors, as well as their causal impact on a population's behavior. The visualization of multiple sociocultural data layers can act as a visual prompt with which to elicit service member narratives, with each narrative adding depth and context to the complete picture. The same data layers can be arranged differently based on mission or user requirements; in this way, while the underlying data is not changed, the dynamic means of visualization is adaptable to suit the preferences of the user. This versatility can extend to subjective data across multiple academic disciplines as well, as is seen in ethno mapping. Ethno mapping uses anthropological and sociological data to geographically depict where different ethnic groups live, offering a multitude of different insights.¹¹⁷ While these ethno maps are a good foundation, they are neither dynamic nor multidimensional enough to provide sufficient insight into the cultural causal loop. This proof of concept addresses the sociocultural gap by transcending these "culture maps" to facilitate cultural understanding by conveying the underlying context behind a population's observed behaviors.¹¹⁸ Of particular importance is the ability for the proof of concept to capture not just one but all of the necessary components and relationships persisting in the culture model. The synergy of multiple data types or "multidimensional data fusion" allows the sociocultural data as a whole to be looked at through multiple lenses, enhancing the understanding of the battlefield by the military.¹¹⁹

¹¹⁷ Caitlyn Dempsey Morais, "What is Ethno Mapping?" GIS Lounge, March 1, 2012, accessed April 06, 2015, <http://www.gislounge.com/what-is-ethno-mapping/>.

¹¹⁸ Jean, "'Culture Maps' Becoming Essential Tools of War."

¹¹⁹ Merten, *Employing Data Fusion in Cultural Analysis and COIN in Tribal Social Systems*, 77.

F. CROWDSOURCING

Cloud computing and advances in information technology have made GIS readily accessible to almost anyone and allow for a single database that can be populated, queried, edited, and displayed in real-time or near-real-time by multiple users simultaneously. It further adds the utility of crowdsourcing as a way to populate and validate cultural data. With the advancement in cloud computing, data storage and processing remain server-based, mitigating any limitations from the client side, therefore allowing for advanced capabilities without relying on the processing power of the end user's computer.¹²⁰ Web-based services, with ArcGIS Online in particular, allow for GIS capabilities across multiple platforms, such as computers, tablets, or even smartphones, without the requirement for any special software other than a web browser.¹²¹ User data can even be collected and interacted through ESRI's proprietary Collector App.¹²² Since the Collector App was specifically designed to work with ESRI web maps, it enhances the reach of the repository and enables the sharing of narratives at service members' fingertips. Furthermore, a single web-based repository allows multiple users to edit, add to, and query a single database in real time or near real-time. Any user connected to the database will see new data almost as soon as it is populated, allowing for a global level of collaboration and common understanding not currently achievable within the conventional reporting process. This collaborative crowdsourcing enables the DOD community to pool its collective knowledge and build a complete picture. Users are able to verify geospatial content and take steps to ensure that any errors are corrected, such as commenting on or flagging features for follow-up by the greater community.

Validation of data layers is crucial, from the principle that maps in general have some sort of intrinsic authority in them, representing something that is beyond one's own

¹²⁰ Law and Collins, *Getting to Know ArcGIS for Desktop*, 26.

¹²¹ Environmental Systems Research Institute, "ArcGIS Online—Create Web Maps, Applications, and Data in the Cloud."

¹²² Environmental System Research Institute, "Collector for ArcGIS," accessed April 13, 2015, <http://www.esri.com/software/arcgis/collector-for-arcgis>.

experiences.¹²³ Because of this authority and inherent trust placed in them by map users, maps can mislead users if not depicted correctly, whether consciously designed that way—with obvious or concealed biases—or not, illustrating a need for data validation.¹²⁴ Validation is needed not just in terms of whether data is correct, but at which scale it was coded, and whether that particular level of geospatial fidelity is articulated in the data itself or its associated metadata. This type of validation would address the current challenge of not knowing how precisely data was coded, which currently makes predictive analysis even more tenuous than it otherwise could be. The living repository allows users to explore explicit relationships between factors through narratives, as well as geospatially-implied relationships revealed through the visual interplay of data layers. This is greatly assisted by designating the level of geospatial fidelity when a user is populating geospatial data into the repository. Features, including narratives, must be tagged as to whether they apply to a specific location, small area (neighborhood or city), large area (county, district, or province), or even to a nation in general. Furthermore, the repository demonstrates the power of versioning, where one can track changes in behavior or sentiment over time, allowing for trend analysis as a situation develops and/or proceeds through all phases of military operations

This proof of concept allows for validation of uncertain map data through crowdsourcing the collective knowledge of users who may be in a position to verify data firsthand. This validation aspect has been demonstrated in crisis situations, with one example being the 2011 earthquake and subsequent Tsunami that struck Japan: GISCorps, a U.S.-based volunteer team of GIS experts, produced an interactive, updated map containing information on key infrastructure, shelters, and essential services. Essential to this effort was data provided by people on the ground, who could verify what was actually occurring versus what the map displayed.¹²⁵ Furthermore, this validation

¹²³ Harvey, *A Primer of GIS: Fundamental Geographic and Cartographic Concepts*, 12.

¹²⁴ Mark S. Monmonier, *How to Lie with Maps*, 2nd ed. (Chicago: University of Chicago Press, 1996), 1–2.

¹²⁵ Peter Folger, *Geospatial Information and Geographic Information Systems (GIS): An Overview for Congress* (Washington DC: Congressional Research Service, 2011), 11.

method allows users in principle to create and upload GIS data layers, have them verified by those on the ground, and export them into other analytical or predictive analysis models or tools. In this way, crowdsourcing grants this sociocultural repository the ability to ingest previously unverified data to get a first-hand perspective, either disputing the validity of the data or lending it more credibility. This will assist in bridging the gap between academia and deployed service members as well, allowing for collaboration and exchange of real-time empirical data to aid in either developing or disproving sociological theories, as well as policies derived from them.

Aside from validation, crowdsourcing can also help develop a unique sense of community among participants, especially if they feel that they are contributing to a common goal.¹²⁶ Users can comment on other users' narratives, creating the possibility for cultural dialogue that further enhances cultural understanding and gives even greater insight into the dynamics of the cultural causal loop as shown in Chapter III, Figure 2. The universal nature of the proof of concept can also be seen in the programming of the JavaScript-based web application. JavaScript—a well-known and widely-used programming language—was originally developed in 1995 and “has made modern web applications possible.”¹²⁷ It is versatile and flexible, providing an interactive, dynamic user experience across any platform using a web browser.¹²⁸ When posting a narrative to the repository, a user also has the ability to customize his or her experience and prompts, further streamlining the process.

G. CONCLUSION

With an anthropologically sound sociocultural ontology as its foundation, this capstone project aims to resolve the three identified sociocultural gaps by fusing narratives, GIS, and crowdsourcing into a proof of concept prototype for an enterprise

¹²⁶ Christian Heipke, “Crowdsourcing Geospatial Data,” *ISPRS Journal of Photogrammetry and Remote Sensing* 65, no. 6 (11, 2010), 552.

¹²⁷ Marijn Haverbeke, *Eloquent JavaScript : A Modern Introduction to Programming*, 2nd ed., (San Francisco, CA, USA: No Starch Press, 2014), 6, <http://site.ebrary.com/lib/nps/docDetail.action?docID=10998284&ppg=1>.

¹²⁸ *Ibid.*, 6–7.

sociocultural living repository. The *Five Operational Culture Dimension* model provides the ontology for classifying sociocultural variables, taking into consideration the cultural causal loop and the interplay between sociocultural factors and behaviors. The untapped potential of service member narratives further provides vital context into the behaviors and sociocultural factors as derived from stories of service members' cross-cultural experiences and observations. A combination of open-ended and rating scale questions gives added breadth to narratives by framing respondents' sociocultural observations. Using a web-based GIS to store, aggregate, and share sociocultural data allows these service member narratives to be temporally and geospatially referenced and displayed along with sociocultural factor data, providing added richness to data visualization in the ability to show trends and relationships—geospatial or temporal—between sociocultural variables. Furthermore, crowdsourcing provides a means for populating and validating sociocultural data by service members, drawing on the collective knowledge of those on the ground. Finally, the fusion of methodologies provides a potential enterprise solution for bridging the sociocultural gap, known as the Sociocultural-Geospatial Anthropological Portal, or SC-GAP.

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IV. PROOF OF CONCEPT

“An effective proof of concept (POC) bridges the gap between expectations and reality.” —ETL Solutions

A. PURPOSE, GOAL, AND OBJECTIVES

Sociocultural-Geospatial Anthropological Portal (SC-GAP) is the proof of concept solution to resolving the DOD’s three identified sociocultural gaps—a data gap, a repository gap, and a collaboration gap—which currently exist between the DOD’s desired and actual states of strategic performance. SC-GAP bridges these sociocultural gaps through the use of three mutually supportive methodologies—narratives, Geospatial Information Systems (GIS), and crowdsourcing—culminating in the generation of a web-based DOD sociocultural living repository comprised of a unique dataset of service members’ cultural observations and experiences. The goal of SC-GAP is to leverage the previously detailed evidentiary base derived from the gap analysis, existing DOD client-server GIS capabilities, and a collaborative custom interface to best collect, visualize, and share sociocultural data between service members and decision makers in near-real-time. SC-GAP’s objectives include:

- Demonstrate the means to elicit and collect the unique sociocultural dataset based on service member narratives
- Demonstrate a singular living repository structured around the proposed common and intuitive sociocultural framework
- Maximize accessibility, data volume, and utility while working within the existing DOD resources and infrastructure
- Increase the DOD’s sociocultural understanding and its implementation into military planning and operations
- Enhance existing DOD processes, initiatives, and decision making

B. SCOPE

Three criteria were used to select and bound the sociocultural and geographic extent encompassed by SC-GAP: 1) the population must be culturally diverse highlighting SC-GAP’s ability to display multidimensional and contextual information; 2) the population and geographic area must be well documented to allow for the creation of rich data sets from which to display; and 3) the population must be currently relevant

to ongoing U.S. military operations. These three criteria led to the selection of the Afghan tribal population residing within the geographic boundaries of the former U.S. Regional Command South (RC-South) area of operations. This military operational boundary provided a clearly defined area of research that was easily identifiable, relevant, and consumable by military decision makers. Additionally, the scale of research was confined to the regional-level due to its ability to provide a reasonable sample of the complexity posed by the greater Afghan population, as well as an abundance of sociocultural data developed over nearly 14 years of U.S./NATO-led war in the region. RC-South encompassed six provinces—Kandahar, Zabul, Dai Kundi, Uruzgan, Helmand, and Nimruz located in southern Afghanistan (see Figure 6).

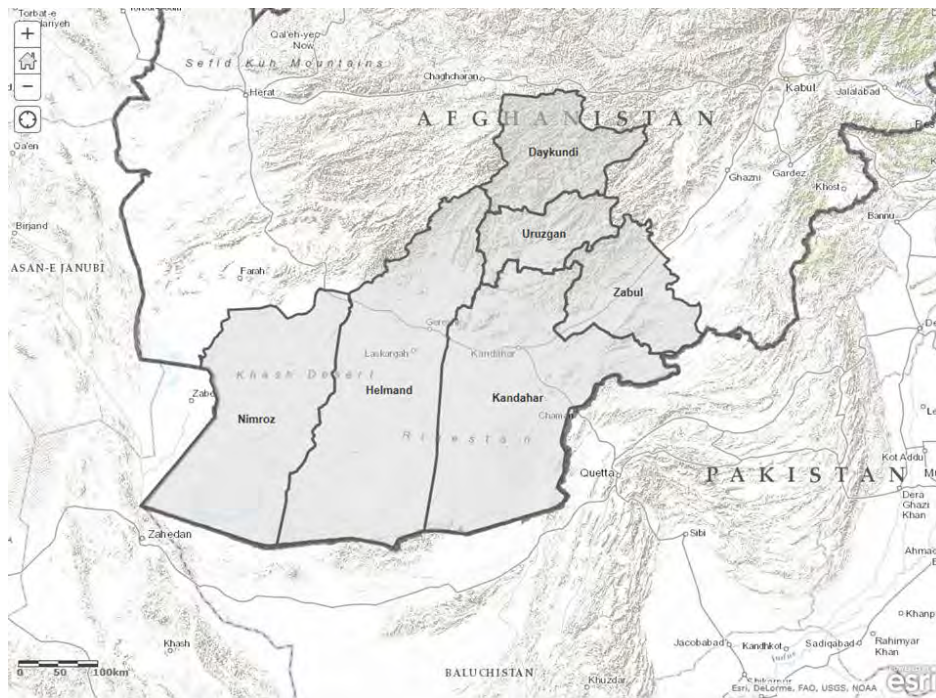


Figure 6. Map depicting administrative boundaries of Regional Command—South, Afghanistan

C. CORE COMPONENTS

SC-GAP uses a GIS, allowing the user “to view, understand, question, interpret, and visualize our world in ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts.”¹²⁹ Within the GIS environment, SC-GAP maintains three core components—a geodatabase, published online services, and a custom user interface. Using the Salmoni and Holmes-Eber’s *Five Operational Culture Dimensions* model, SC-GAP’s geodatabase structures the inputted narrative data by applying an anthropologically sound hierarchal framework, resulting in the subsequent generation of 31 cultural variables comprised of 116 subordinate cultural trait data layers within the SC-GAP geodatabase, as shown in Figure 7. Each of these variable and trait data layers contain associated attributes by which the data is indexed, stored, and queried. The associated attributes include the National Geospatial-Intelligence Agency’s 13 Human Geography Themes, Joint Phasing model, level of data fidelity, cultural model, cultural dimension, and administrative data.¹³⁰

¹²⁹ Environmental Systems Research Institute, “What is GIS?” accessed April 15, 2015, <http://www.esri.com/what-is-gis/howgisworks>.

¹³⁰ “World-Wide Human Geography Data Working Group - Theme Areas,” Geoplatform.gov, accessed May 10, 2015, <http://www.geoplatform.gov/wwhgd-theme-areas>.

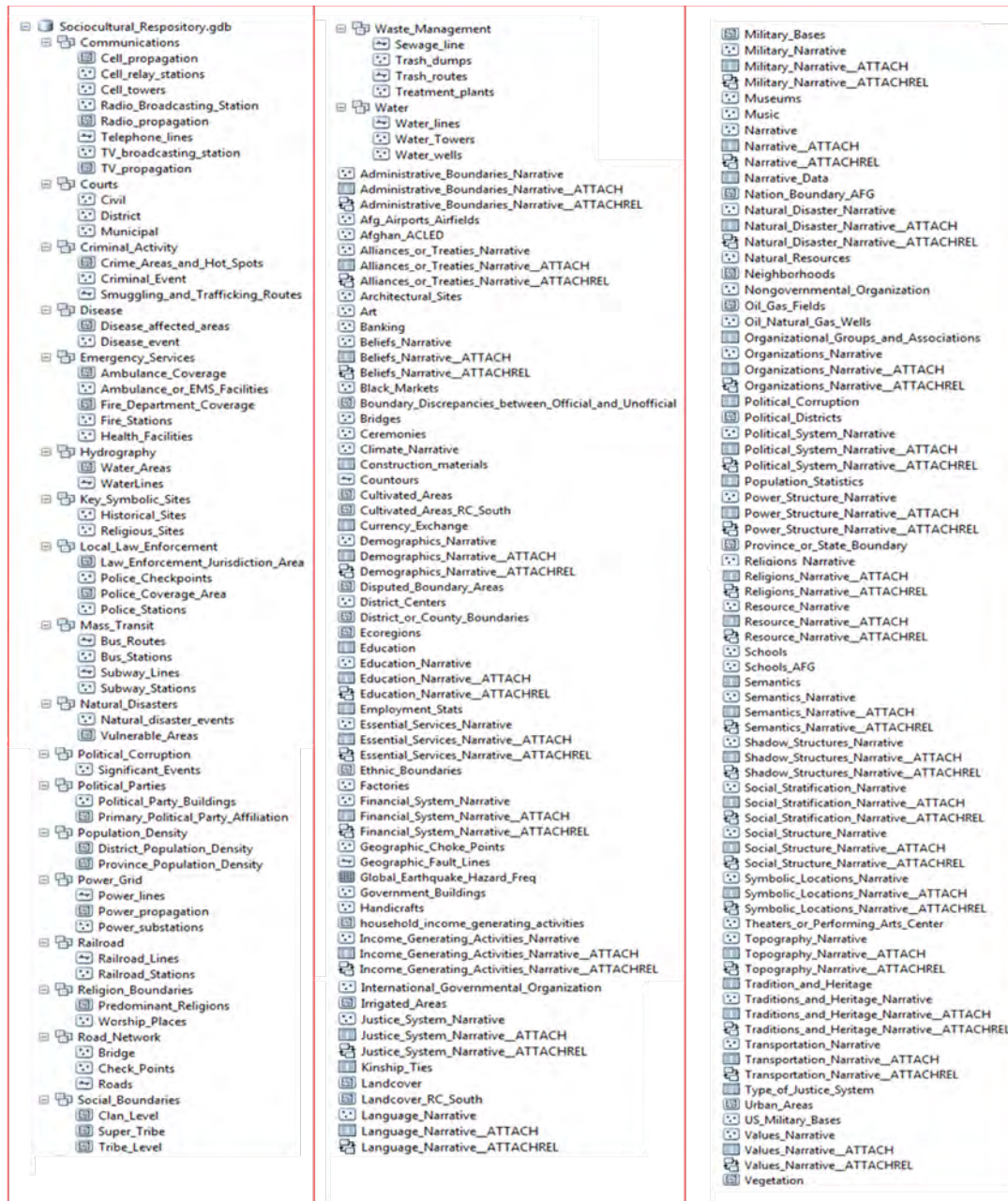


Figure 7. SC-GAP geodatabase, which consists of 31 cultural variables comprised of 116 subordinate cultural trait data layers; its structure is derived from the Five Operational Culture Dimensions model depicted in Figure 4

Of the 147 variables and traits, a total of 58 were published as web services using the Environmental Systems Research Institute (ESRI) ArcGIS online platform. These services include 31 narrative variables and 27 sociocultural factors, as shown in Figure 8. The published web services serve as the conduit between the geodatabase and the user interface, configuring the data output viewed by the interface while validating the data inputted into the geodatabase.¹³¹ Each published service reflects a distinct feature class—point, line, and polygon—with unique symbology, attributes, prompts, and viewable outputs. The published services are transparent to the user, running in the background GIS environment as an administrative function.

Administrative Boundaries Narrative	Resource Narrative	Military Bases - HN Military Bases
Alliance or Treaties Narrative	Semantics Narrative	Nongovernmental Organization
Beliefs Narrative	Service Member Narrative	Natural Disaster Events
Climate Narrative	Shadow Structure Narrative	Natural Disaster Vulnerable Areas
Demographics Narrative	Social Stratification Narrative	Oil Natural Gas Wells
Education Narrative	Social Structure Narrative	Predominant Religions
Essential Services Narrative	Symbolic Locations Narrative	Province or State Boundary
Financial Systems Narrative	Topography Narrative	Roads
Income Generating Activities Narrative	Traditions and Heritage Narrative	Roads Bridges
Infrastructure Narrative	Transportation Narrative	Schools - Schools AFG
Intellectual Expression or Folklore Narrative	Values Narrative	Social Clan Level
Justice System Narrative	Airports - Afg Airports Airfields	Social Super Tribe Level
Language Narrative	Cultivated Areas RC South	Social Tribel Level
Local Law Enforcement Narrative	Disputed Boundary Areas	Urban Areas
Military Narrative	District or County Boundaries	US Military Bases
Natural Disaster Narrative	Ethnic Boundaries	Water Areas - Bodies of Water
Organizations Narrative	Geographic Choke Points	Water Lines - Rivers and Streams
Political System Narrative	Government Buildings	Elevation
Power Structure Narrative	Key Historical Sites	
Religions Narrative	Landcover	

Figure 8. SC-GAP's published services via ArcGIS Online serve as the conduit between the geodatabase and the user interface

The user interface is a JavaScript-based multi-client supported web application developed in conjunction with ESRI (see Figure 9). The interface serves as the user's access portal into the geodatabase, enabling users to post new sociocultural data, as well as interact with existing data within SC-GAP. The JavaScript-based interface maximizes

¹³¹ Environmental Systems Research Institute, "Web Services—A Standards-Based Framework for Integration," accessed May 6, 2015, <http://www.esri.com/news/arcuser/0403/webservices.html>.

the accessibility of the portal by minimizing the requirement for unique scripting and client specific development. The client-server GIS model supports any networked or standalone client to include web browsers and mobile platforms to access SC-GAP.¹³² The custom development of the interface includes a new adaptive page layout and web design; a hierarchal Table of Contents (ToC) to structure the multiple cultural models, dimensions, variables, and traits within the interface; an intuitive prompt to elicit and capture the user's narrative in a meaningful way; and a feedback mechanism to allow for data validation, comments, and utility ranking.

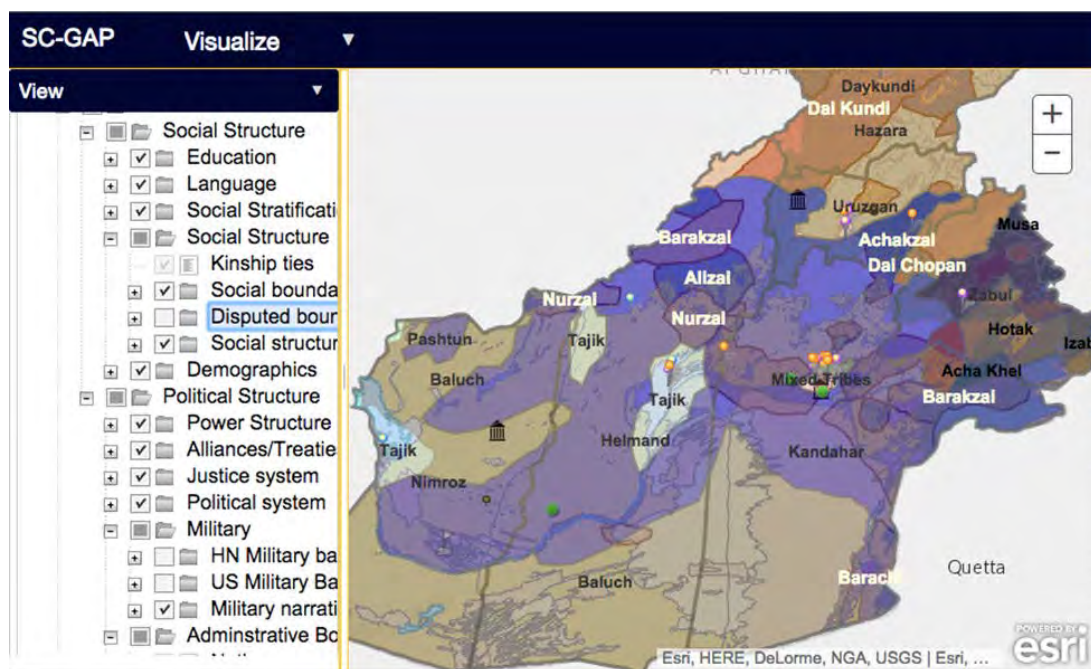


Figure 9. SC-GAP user interface serves as the user's access portal into the geodatabase and allows users to post new sociocultural data and interact with existing data within SC-GAP¹³³

¹³² Environmental Systems Research Institute, "Web Services - A Standards-Based Framework for Integration."

¹³³ Image created using data from references 1, 2, 4, 5, 6, 7, 8, and 9 in Appendix C, Table 6.

D. BRIDGING THE GAP: THE SC-GAP PROCESS

Given its scope and components, SC-GAP incrementally accomplishes its aforementioned goals, purpose, and objectives incrementally through the repetition of the SC-GAP process. SC-GAP bridges the sociocultural gap (illustrated by Figure 1 in Chapter II), using the four-step process shown in Figure 10. Key nodes in the process include a local population, the service member, the SC-GAP repository itself, and the DOD-wide community as a whole. The SC-GAP process is a closed loop system comprised of inputs, outputs, and throughputs, with each iteration of the process contributing to the collective sociocultural knowledge contained within the repository. The process, discussed in depth in the following sections, proceeds through the steps identified by the numbers in Figure 10 as follows: 1) Data flows from a population via sociocultural factors and behaviors, which are observed and internalized by the service member; 2) The service member produces a narrative and articulates it into the SC-GAP repository, along with new or updated sociocultural factor data; 3) The SC-GAP repository aggregates captured narratives and sociocultural factor data from multiple users, yielding military-relevant sociocultural data that can be used by decision makers at all levels of the DOD; and 4) Decision makers DOD-wide use the SC-GAP knowledge to plan and execute culturally adept military operations. These operations impact the local population via the cultural causal loop, shaping sociocultural factors and potentially the resulting behaviors, thereby continuing the SC-GAP cycle.

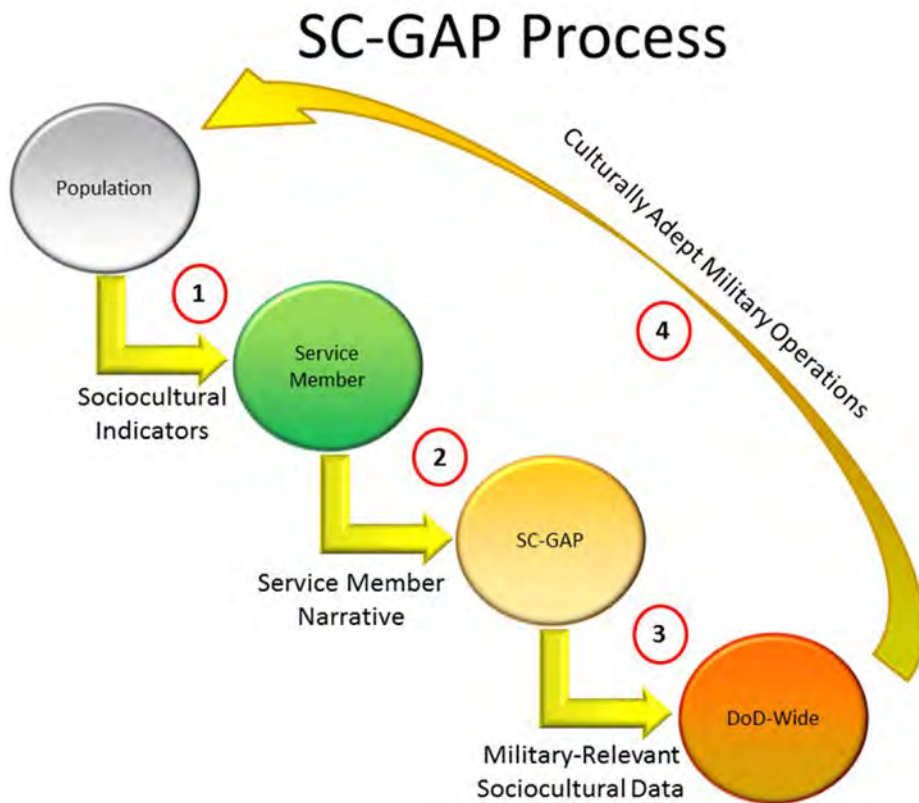


Figure 10. SC-GAP process flow chart: the SC-GAP process is a closed loop system, with each iteration of the process contributing to the collective sociocultural knowledge contained within the repository.

E. POPULATION, SOCIOCULTURAL FACTORS, BEHAVIORS

During the first step of the process, deployed service members observe or experience sociocultural factors and behaviors of a populace either directly or indirectly. These observable behaviors, the result of the cultural causal loop mentioned in Chapter III (e.g., Figure 2), promote a certain level of cultural understanding with respect to a population through the service member's perspective. Deployed service members who interact directly with a population are in the best position to observe these sociocultural factors and behaviors and to provide the unique narrative dataset around which the SC-GAP is designed. The service member internalizes observations and experiences, expressing these sociocultural factors and behaviors in narrative form from his or her perspective.

F. SERVICE MEMBER NARRATIVE

During the second step of the SC-GAP process, the service member produces a narrative, which the SC-GAP repository then captures. This is accomplished by inputting two types of data into SC-GAP: narratives, with quantitative and qualitative components, and sociocultural factors. The service member—hereafter referred to as the user—articulates his or her experiences with a population into SC-GAP using the web-based interface and sociocultural data layers to prompt the user's narratives within the cultural framework mentioned in Chapter III. Furthermore, users can add new sociocultural factor data to SC-GAP, as well as validate or dispute existing narratives and sociocultural factor data.

The user inputs his or her narrative into the SC-GAP repository using a server-based GIS interface following a series of intuitive prompts that structure the narrative in a usable format. An example is illustrated in Figure 11. The initial prompts ascertain the location, geospatial precision, and effective date of the user's narrative. Two rating scale questions comprise the quantitative data portion of the narrative: 1) to what extent the particular sociocultural factor is a main concern for the local populace from the user's point of view, and 2) to what extent it leads to grievances or potential conflicts. The interface prompts the user to type his or her story into the provided text boxes with open-ended questions about how the sociocultural factor affects the local population and its way of life, how the sociocultural factor affects U.S. military operations in the area, one or two additional questions specific to an aspect of that particular factor, and finally an opportunity to express any additional observations or insight about the sociocultural factor or behavior observed. These prompts act as a guide to ensure that the narrative is relevant to that particular sociocultural factor but not overly structured. Answers provided to the open-ended questions comprise the qualitative data portion of each narrative. The user can input narratives on one or more sociocultural factors for the same location in the same session and attach media files (pictures, video, audio, etc.) to better explain the user's story, having an opportunity to review each one before submission.

Figure 11. SC-GAP narrative input interface, which allows users to share their stories with other SC-GAP users¹³⁴

Users can also update or input new sociocultural factor data, validate or dispute existing sociocultural factor and narrative data, and use an intuitive pop-up validation system to explore data, as illustrated in Figure 12. To validate or dispute a narrative or sociocultural factor data feature, the user clicks on that feature to bring up a popup window and then selects whether to “confirm feature” or “dispute feature.” When individual narratives or sociocultural factors are submitted, SC-GAP stores them in the geodatabase and makes the data available for all users to view, validate, or dispute. This crowdsourced validation method is the primary means for data quality assurance and promotes a self-policing SC-GAP user community.

¹³⁴ Image created using data from references 1, 4, and 6 in Appendix C, Table 6.

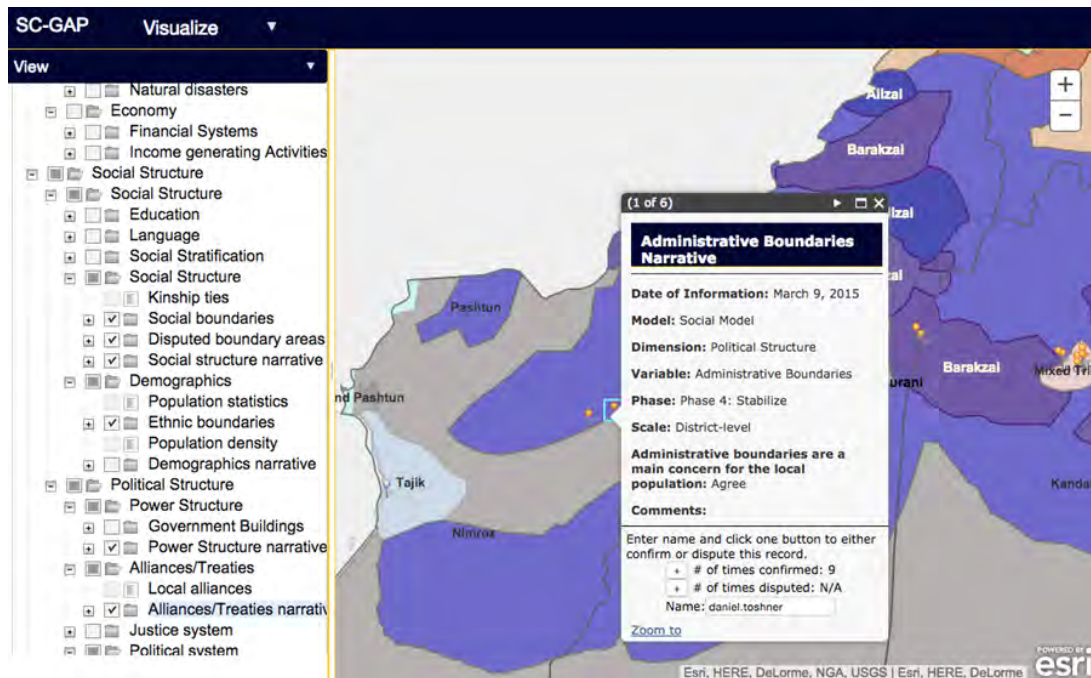


Figure 12. SC-GAP data validation popup allows users to explore and validate, or dispute, existing sociocultural factor and narrative data¹³⁵

G. SC-GAP AND MILITARY-RELEVANT SOCIOCULTURAL DATA

During the third step of the process, SC-GAP aggregates captured narratives from multiple users, yielding military-relevant sociocultural data that decision makers at all levels of the DOD can use. The SC-GAP repository, designed as an enterprise system, provides service members with crowdsourced narratives and other culturally-relevant data, structured using the aforementioned cultural framework (shown in Chapter III, Figure 4). Users can query narratives by phase of the Joint Phasing model, rank, geospatial location, or date, or by simply using the interface to browse for narratives or other cultural factors within a certain geospatial extent by selecting which data or narrative layers they want to view. SC-GAP allows for a fusion of narrative and non-narrative data in the same visualization, as well as the aggregation of narratives from multiple users, categorized by narrative variable. SC-GAP is a dynamic, living repository, continually updated in (or near) real-time, and as such, possesses the ability to

¹³⁵ Image created using data from references 1, 4, 6, 8, and 9 in Appendix C, Table 6.

show trends in data over time since each narrative and piece of data is coded with a geospatial location and specific time. Furthermore, it is designed to incorporate other features, such as links to websites, photos, and multimedia, enhancing its versatility.

Visualization features of SC-GAP include the standard view mode, data dashboard, narrative gallery, and a reports window. The following four figures will explain each of these features in turn.

In the standard view mode, shown in Figure 13, the user views and interacts with sociocultural factor and narrative data through a hierarchical selection system. Individual data layers are selected by choosing the model, then the variable, then the specific sociocultural trait, and finally the data layer itself. As an additional option, selecting a variable or model for viewing will display all subordinate layers in the map window. Layers can be selected and deselected until the desired visualization is achieved.

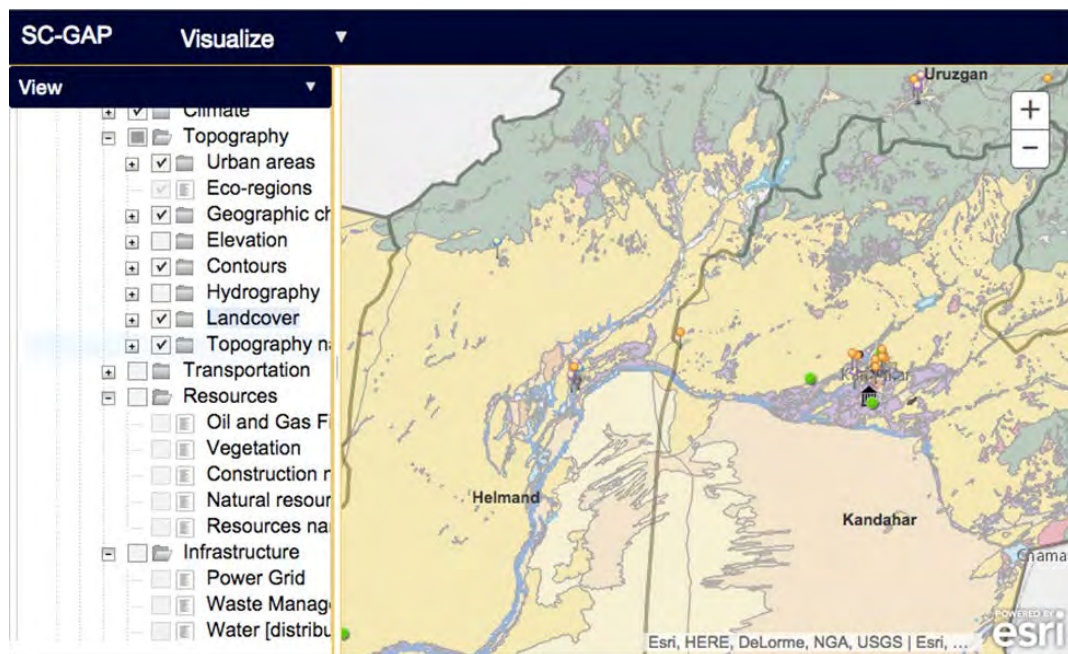


Figure 13. SC-GAP standard view allows users to interact with sociocultural and narrative data through a hierarchical selection system¹³⁶

¹³⁶ Image created using data from references 1, 2, 5, and 6 in Appendix C, Table 6.

The dashboard feature, shown in Figure 14, displays customizable charts and graphs derived from sociocultural data, providing the user of a snapshot of what is depicted on the map based on selected criteria. It can reflect popular sentiment or grievances based on quantitative data from the narratives, indicate which data layers are the most validated or disputed, or where data on a particular sociocultural factor is missing or scarce. The dashboard allows the user to analyze trends in the quantitative narrative data over time, as well as compare quantitative data among different narrative variables.

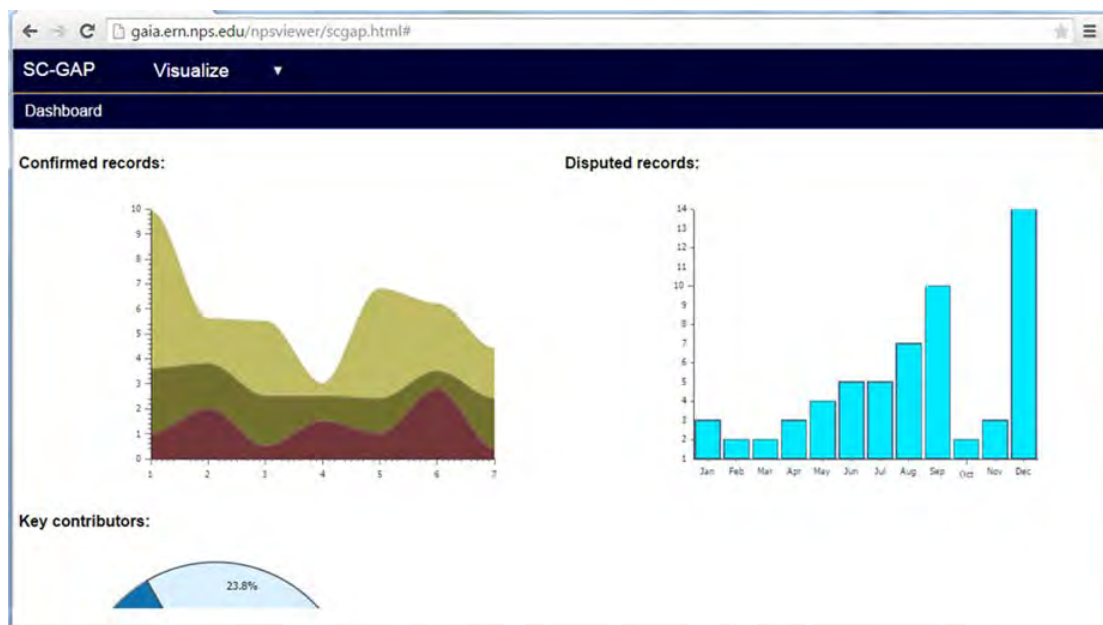


Figure 14. SC-GAP dashboard feature displays charts and graphs to provide users with a snapshot of what is depicted on the map based on selectable criteria

The narrative gallery feature, shown in Figure 15, provides a separate page for isolating and interacting with, filtering, and querying narrative (semi-structured and unstructured) data apart from the sociocultural factor data. Whereas all 147 data layers can be accessed through the visualize function, only the 31 narrative data layers can be viewed in the narrative gallery. This eliminates map clutter and streamlines the process for users interested in just the narrative data in the SC-GAP repository.

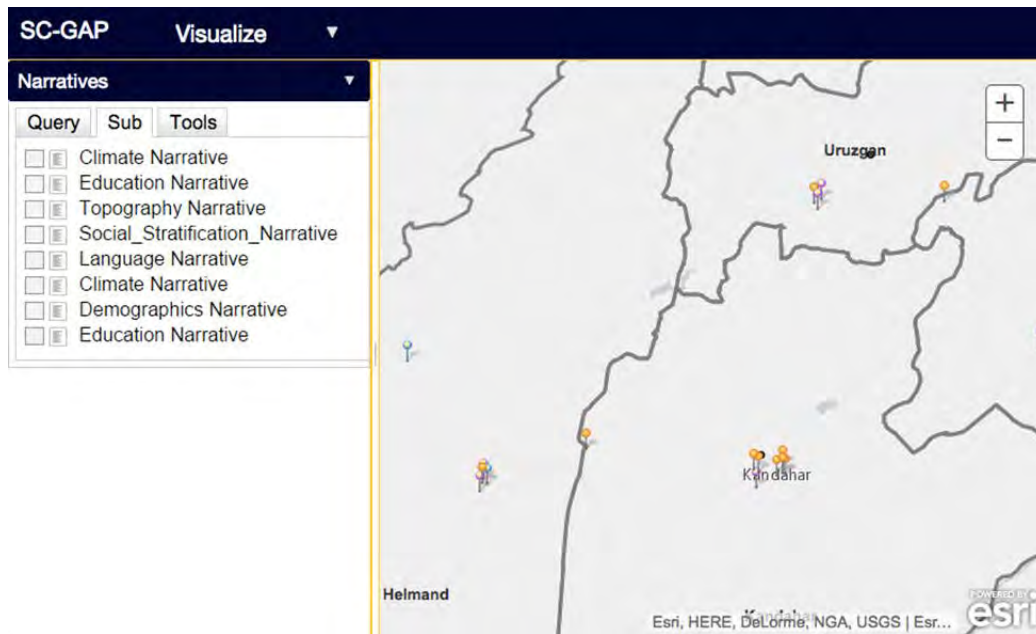


Figure 15. SC-GAP narrative gallery feature allows users to explore and interact with narrative data apart from other sociocultural factor data, reducing map clutter¹³⁷

The Reports feature, shown in Figure 16, provides the user a separate window in which to explore attribute data in depth, allowing the user to query the data by selected attribute fields and run reports to show an overview of the data. These reports can then be exported to a spreadsheet file for ingestion into other analytical tools or programs. While the dashboard feature mentioned above is a useful tool to assist in quantitative analysis, the Reports feature allows a user to look at the qualitative data and potentially analyze trends over time in the language of the narratives. The Reports feature enables users to customize their queries and filters based off of their unique mission or command requirements, displaying only narrative data that the user deems relevant and saving the valuable resource of time.

¹³⁷ Image created using data from references 1 and 6 in Appendix C, Table 6.

View	Date of Info	Service	Unit	Rank	Gender	Location	Model	Dimension	Variable	Jc
X	13-Feb-05	Army	82nd ABN DIV	E-7	M	Kandahar	Social	Social Structure	Education	Phase 4: Stat
<input type="checkbox"/>	21-Sep-12	Army	82nd ABN DIV	O-2	M	Jalalabad	Social	Social Structure	Ethnic Boundaries	Phase 4: Stat
<input type="checkbox"/>	3-Mar-12	Army	82nd ABN DIV	O-2	M	Herat	Ecological	Physical Environment	Geographic Choke Points	Phase 4: Stat
<input type="checkbox"/>	23-Nov-12	Army	82nd ABN DIV	E-4	F	Herat	Social	Political Structure	Organizations	Phase 4: Stat
<input type="checkbox"/>	30-Jan-15	Army	82nd ABN DIV	O-5	M	Kabul	Ecological	Economy	Financial Systems	Phase 5: Enal
<input type="checkbox"/>	2-Sep-10	Army	82nd ABN DIV	O-2	F	Kandahar	Social	Political Structure	Shadow Structures	Phase 3: Don
<input type="checkbox"/>	21-Nov-12	Army	82nd ABN DIV	E-6	F	Mazar-i-Sharif	Symbolic	Beliefs & Symbols	Religions	Phase 4: Stat
<input type="checkbox"/>	14-Mar-03	Army	82nd ABN DIV	E-3	M	Kandahar	Social	Political Structure	Shadow Structures	Phase 2: Seiz
<input type="checkbox"/>	21-May-03	Army	82nd ABN DIV	O-2	M	Kandahar	Social	Political Structure	Shadow Structures	Phase 2: Seiz
<input type="checkbox"/>	13-Jul-07	Army	82nd ABN DIV	E-7	M	Kandahar	Social	Political Structure	Shadow Structures	Phase 3: Don
<input type="checkbox"/>	3-Dec-14	Army	82nd ABN DIV	O-4	M	Herat	Ecological	Physical Environment	Infrastructure	Phase 5: Enal

Figure 16. SC-GAP reports view allows users to query, filter, and explore attribute data in depth, as well as export reports for use in other analytical tools or programs

H. DOD-WIDE COMMUNITY AND CULTURALLY ADEPT MILITARY OPERATIONS

The final step of the process involves synchronizing DOD efforts to achieve a common sociocultural understanding, allowing decision makers at all levels to integrate that understanding into military planning and operations. SC-GAP reveals not only potential friction points or societal fault lines, but potentially allows for near real-time feedback to help determine the effectiveness of a particular military operation or line of effort and thus enhancing the cultural adeptness of military operations. Visualizations from SC-GAP can be exported as images to give data snapshots at a certain time intervals or to enhance decision maker briefings. Additionally, SC-GAP can export raw data in a shapefile format for use in other GIS software packages, or as a comma separated value (CSV) file for use in spreadsheet-based software. SC-GAP can easily integrate into existing planning and analytical processes, enhancing mission planning and promoting culturally adept military operations. These culturally adept operations affect the population, feeding into the causal cultural loop and eliciting more sociocultural factors and behaviors, thus continuing the cycle.

I. APPLICABILITY OF SC-GAP

With the DOD shift toward population-centric warfare, they have produced and implemented frameworks designed to facilitate careful examination of key operational environment (OE) factors in order to bolster analytical capabilities for service members. Assessments of the OE through these existing structures—Joint Intelligence Preparation of the Operational Environment (JIPOE);¹³⁸ political, military, economic, social, infrastructure, information, physical environment, and time (PMESII-PT);¹³⁹ areas, structures, capabilities, organizations, people, and events (ASCOPE);¹⁴⁰ Distributed Common Ground System—Army (DCGS-A);¹⁴¹ and diplomacy, information, military, economics (DIME)¹⁴²—can become enhanced when concurrently applying the full functionalities and capabilities of SC-GAP. Figure 17 illustrates that SC-GAP complements the existing frameworks; rather than competing, SC-GAP offers a unique set of data for users to apply to existing frameworks in support of military operations.

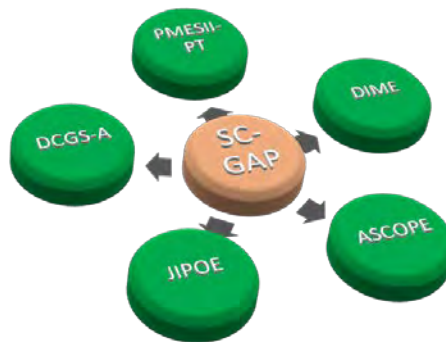


Figure 17. SC-GAP complements the DOD’s existing sociocultural-relevant frameworks, such as PMESII-PT, DIME, ASCOPE, JIPOE, and DCGS-A with its 147 sociocultural variables and traits

¹³⁸ U.S. Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment* (JP 2-01.3) (Washington, DC: U.S. Joint Chiefs of Staff, 2009).

¹³⁹ Department of the Army, *Operations* (FM 3-0), 1-5–1-9.

¹⁴⁰ Department of the Army, *Tactics in Counterinsurgency* (FM 3-24.2), 1-8.

¹⁴¹ Distributed Common Ground System—Army, “About DCGS-A,” last modified May 7, 2014, accessed April 15 2015, http://dcgsa.apg.army.mil/about_dcgsa.

¹⁴² U.S. Joint Chiefs of Staff, *Doctrine for Joint Special Operations* (JP 3-05), I-11–I-13.

1. JIPOE

SC-GAP complements the JIPOE process, defined as “the analytical process used by joint intelligence organizations to produce intelligence assessments, estimates, and other intelligence products in support of the joint force commander’s (JFC’s) decision-making process.”¹⁴³ The living repository possesses the ability to directly contribute to the first two steps of the JIPOE process—*Define the Operational Environment* and *Describe the Impact of the Operational Environment*—which heavily rely on the value of a proper sociocultural comprehension by satisfying the components of the two steps, as shown in Figure 18.¹⁴⁴ For example, the second step of the JIPOE process highlights the value of observing several sociocultural factors, such as political and military limitations, history, infrastructure, economics, and religion, and their potential impact on military operations: SC-GAP provides a unique dataset comprised of service member narratives and observations.¹⁴⁵ The SC-GAP dataset can include service members’ personal encounters and experiences with local populations and cultures, providing a means by which users can examine and observe sociocultural factors and behaviors relevant to military operations. Such a dataset can contribute to comprehending the OE pertinent to military operations. With DOD service members deployed globally and the ability to collect and share their sociocultural observations, SC-GAP can present appropriate data. By featuring near real-time data, SC-GAP can effectively offer relevant details in a timely manner, supporting the first step of the JIPOE process through providing information “required and feasible within the time available.”¹⁴⁶ Additionally, SC-GAP plays a key role in support of stability operations and irregular warfare, during which acquiring relevant sociocultural data becomes critical in the JIPOE process.¹⁴⁷

¹⁴³ U.S. Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment* (JP 2-01.3), xi.

¹⁴⁴ Ibid., xii.

¹⁴⁵ Ibid., II-42–II-44.

¹⁴⁶ U.S. Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment* (JP 2-01.3), xi, II-2.

¹⁴⁷ Ibid., IV-1–IV-2.

JIPOE	SC-GAP Applicability
Define the Operational Environment	✓
Describe the Impact of the Operational Environment	✓
Evaluate the Adversary	
Determine Adversary Courses of Action	

Figure 18. Applicability of SC-GAP to the JIPOE process¹⁴⁸

Various members of the DOD can benefit from applying the SC-GAP data to the JIPOE process. As the J2 staff collaborates with different staff members “to formulate an initial survey of adversary and other relevant characteristics that may impact both friendly and adversary operations,” it can efficiently use the data presented by SC-GAP to evaluate and define the OE.¹⁴⁹ SC-GAP also supports users of all levels—strategic, operational, and tactical—as it possesses a function that enables users to identify the level of geospatial fidelity when posting their data. Thus, users can properly implement sociocultural data throughout the whole JIPOE process as it “is both continuous and cyclical”; the repository retains sociocultural data relevant to all phases of the Joint Phasing model and can continuously support its users.¹⁵⁰

2. PMESII-PT

PMESII-PT represents another framework which can benefit from SC-GAP capabilities, focusing on the OE comprehension through the incorporation of eight variables: political, military, economic, social, information, infrastructure, physical environment, and time.¹⁵¹ These operational variables signify “those broad aspects of the environment, both military and nonmilitary, that may differ from one operational area to

¹⁴⁸ Chart built using information derived from U.S. Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment* (JP 2-01.3).

¹⁴⁹ U.S. Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment* (JP 2-01.3), II-2 to II-3.

¹⁵⁰ U.S. Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment* (JP 2-01.3), II-1.

¹⁵¹ Department of the Army, *Operations* (FM 3-0), 1-5–1-9.

another and affect campaigns and major operations. Operational variables describe not only the military aspects of an operational environment but also the population's influence on it.”¹⁵² As shown in Figure 19, the framework and ontology that SC-GAP maintains provide a mechanism through which users can observe sociocultural factors and resulting behaviors that encompass one or more of the eight operational variables. While SC-GAP's sociocultural variables directly reflect the eight PMESII-PT variables, the repository also has the ability to store and display data for “a view of the operational environment that emphasizes its human aspects,” a fundamental feature for population-centric warfare.¹⁵³ Additionally, SC-GAP depicts service member narratives, which yield an insight into the human population, cultivating the PMESII-PT analysis process.

PMESII-PT	SC-GAP Applicability
Political	✓
Military	✓
Economics	✓
Social	✓
Infrastructure	✓
Information	✓
Physical Environment	✓
Time	✓

Figure 19. Applicability of SC-GAP to PMESII-PT¹⁵⁴

Various types of users can take advantage of SC-GAP when determining the PMESII-PT variables. Just as those benefiting from SC-GAP in support of the JIPOE process, the J2 staff will identify the use of SC-GAP as constructive for the PMESII-PT operational variables. Data collected, visualized, and shared will lead to necessary

¹⁵² Department of the Army, *Operations* (FM 3-0), 1-5.

¹⁵³ Ibid.

¹⁵⁴ Chart built using information derived from Department of the Army, *Operations* (FM 3-0).

information required for PMESII-PT analysis as the J2 staff assists the commander in understanding the operational environment throughout the different military phases.

3. ASCOPE

For strategies focused on the population, the civil factor is critical in military planning and operations. With today's population-centric warfare, the DOD has developed a framework that addresses civil considerations by focusing on areas, structures, capabilities, organizations, people, and events, also known as ASCOPE.¹⁵⁵ The framework is a mechanism designed to assist with various types of civil analysis during the JIPOE process; for example, "the commander and staff analyze civil considerations from several perspectives—the population, the insurgents, and the counterinsurgents—to determine the effects on friendly and enemy courses of action," providing necessary data required for the JIPOE process, especially *Describe the Impact of the Operational Environment*.¹⁵⁶ Ultimately, determining ASCOPE contributes to painting the overall operational picture by identifying the different population groups.¹⁵⁷ Through the variables derived from the ontology and framework, SC-GAP plays a key role in providing necessary data relevant to ASCOPE (see Figure 20). The living repository enables users to fill in gaps that may exist during the ASCOPE analysis process.

¹⁵⁵ U.S. Joint Chiefs of Staff, *Civil-Military Operations* (JP 3-57), IV-5.

¹⁵⁶ Department of the Army, *Tactics in Counterinsurgency* (FM 3-24.2), 1-8.

¹⁵⁷ *Ibid.*

ASCOPE	SC-GAP Applicability
Areas	✓
Structures	✓
Capabilities	✓
Organizations	✓
People	✓
Events	✓

Figure 20. Applicability of SC-GAP to ASCOPE¹⁵⁸

Staff members, as well as Civil Affairs (CA) soldiers, serve as primary users of ASCOPE and can enhance their analytical skills by employing SC-GAP as a data visualization tool. With the need to analyze quickly the civil considerations germane to the OE, staff members can enhance their efforts toward updating the commander with all pertinent data in a timely manner. Ultimately, “Rigorous staff efforts for developing civil understanding early in the planning process are important, and coordination with the J-2 responsible for the JIPOE is critical.”¹⁵⁹ Possessing the capability to deliver data in near real-time, SC-GAP enables users to swiftly select data applicable to the ASCOPE fields. Additionally, SC-GAP can provide CA soldiers with essential data required to build the ASCOPE framework, as they “strive to be the cultural experts for the area of operations and enhance the JIPOE with key civil and cultural considerations.”¹⁶⁰

4. DCGS-A

DCGS-A, along with other service-specific DCGS solutions, employs a similar concept to SC-GAP, implementing a common repository for an information collecting and sharing mechanism.¹⁶¹ While SC-GAP focuses on sociocultural data, DCGS-A leverages “intelligence information and open source technology (such as Amazon,

¹⁵⁸ Chart built using information derived from Department of the Army, *Tactics in Counterinsurgency* (FM 3-24.2).

¹⁵⁹ U.S. Joint Chiefs of Staff, *Civil-Military Operations* (JP 3-57), IV-11.

¹⁶⁰ *Ibid.*

¹⁶¹ Distributed Common Ground System—Army, “About DCGS-A.”

Google and Twitter) to create a scalable environment for collaboration and intelligence production.”¹⁶² However, for intelligence data to become suitable to today’s population-centric warfare, gathered information needs to result in “understanding the social relationships, economic disputes, and religious and tribal leadership of the local communities.”¹⁶³ Thus, the wealth of sociocultural data collected and shared through SC-GAP complements the capabilities of DCGS-A, especially in the human intelligence and open source intelligence fields, cultivating the development of relevant intelligence information.

DCGS-A operators can enhance intelligence data through the usage of SC-GAP. SC-GAP offers not only data based on sociocultural variables, but also information concerning service member observations reflected on identified sociocultural factors and behaviors of a population; it allows DCGS-A users to build and refine their intelligence by considering service member perspectives to the OE. Additionally, DCGS-A operators can mutually support SC-GAP by building and composing vital sociocultural data in SC-GAP based on their intelligence information.

5. DIME

Although the military possesses both lethal and non-lethal capabilities, the military alone cannot win every war as population-centric warfare requires different avenues of approach to provide solutions. Acknowledging this, the United States government as a whole now takes the DIME approach for its statecraft, which focuses on four national power elements: diplomacy, information, military, and economics.¹⁶⁴ These four elements enable “the U.S. to advance its national interests is dependent on the effectiveness of the United States Government (USG) in employing the instruments of national power to achieve national strategic objectives.”¹⁶⁵ While the previous

¹⁶² Distributed Common Ground System—Army, “About DCGS-A.”

¹⁶³ Flynn, Pottinger and Batchelor, *Fixing Intel: A Blueprint for Making Intelligence Relevant in Afghanistan*, 15

¹⁶⁴ U.S. Joint Chiefs of Staff, *Doctrine for the Armed Forces of the United States* (JP 1) (Washington, DC: U.S. Joint Chiefs of Staff, March 25, 2013), I-11–I-13.

¹⁶⁵ *Ibid.*, I-11–I-12.

frameworks focus heavily on the tactical and operational levels, the DIME model focuses on the national level; however, SC-GAP incorporates geospatial fidelity as a means to demonstrate sociocultural information on the strategic level, thus highlighting sociocultural data relevant to the DIME model (see Figure 21).¹⁶⁶

DIME	SC-GAP Applicability
Diplomacy	✓
Information	✓
Military	✓
Economics	✓

Figure 21. Applicability of SC-GAP to DIME¹⁶⁷

Unlike the other exiting frameworks, whose primary users consist of those of the Department of Defense, DIME allows various U.S. Government entities, such as the Department of State, to approach a problem set through a strategic-level lens. Although SC-GAP mainly collects, visualizes, and shares sociocultural data pertinent to military operations, the very nature of sociocultural data delivers critical data significant at the national-level. SC-GAP's multi-level data capability empowers DIME users with basic and in-depth information to conduct an analysis through the model.

J. CONCLUSION

SC-GAP will help to resolve DOD's sociocultural gaps due to its web-based structure, the incremental SC-GAP process, and applicability to current decision making frameworks. Through SC-GAP's three core components—geodatabase, published online services, and a custom user interface—the proof of concept solution provides a tool to unify the Joint Forces' efforts in understanding and implementing sociocultural data into military operations. Deployed service members will be more involved with observing and

¹⁶⁶ U.S. Joint Chiefs of Staff, *Doctrine for the Armed Forces of the United States* (JP 1) (Washington, DC: U.S. Joint Chiefs of Staff, March 25, 2013), I-11–I-13..

¹⁶⁷ Chart built using information derived from U.S. Joint Chiefs of Staff, *Doctrine for Joint Special Operations* (JP 1).

inputting sociocultural factors and behaviors via narrative data into the repository, whereas planners and military decision makers will be involved primarily in the later steps of the process. The server-based multi-client nature of SC-GAP allows for a multitude of concurrent users to be in different steps of the SC-GAP process independent of each other, while each cycle contributes to the body of cultural knowledge contained within the repository. Furthermore, data from the repository can easily be exported to support existing sociocultural frameworks such as PMESII-PT, ASCOPE, and DIME. These various features and functionalities benefit not only the DOD, but also various national agencies, such as Department of State and United States Agency for International Development. SC-GAP's 147 sociocultural variables can assist in synchronizing their efforts and programs, which by nature revolve around the populations of foreign countries. Thus, SC-GAP provides an enterprise solution for bridging the sociocultural gap, providing the benefit of enhanced sociocultural understanding through crowdsourced service member narratives.

V. CONCLUSION

“The British general Rupert Smith argues that war—defined as industrial interstate warfare between armies, in which the clash of arms decides the outcome—no longer exists; that we are instead in an era of ‘war amongst the people.’ —David Kilcullen

A. SUMMARY

The intent of the capstone is to construct a sociocultural knowledge repository designed to support decision makers at all levels with information relevant to military operations. While the Department of Defense (DOD) has recognized the recent shift to population-centric warfare and produced various mechanisms to comprehend the human domain, we have determined that an overarching sociocultural gap hinders the DOD from effectively advancing to the desired and requisite U.S. strategic performance despite the wealth of sociocultural knowledge and experiences retained by service members. By identifying the shortcomings responsible for the existing disconnect, we have designed a proof of concept based on the three recommendations developed during the gap analysis.

Sociocultural—Geospatial Anthropological Portal (SC-GAP) demonstrates a viable solution to bridging the current sociocultural gap. SC-GAP, while constructed with three mutually supportive methodologies—narratives, Geographic Information System (GIS), and crowdsourcing—successfully achieved the five objectives of the proof of concept through its various functionalities and features: presents an inviting and user-friendly interface; incorporates an intuitive ontology for cataloging and organizing sociocultural data and service member narratives; functions as a living repository through which users can access and store relevant data; displays graphics and texts using GIS for an enhanced user experience in exploring and sharing sociocultural data; and exhibits in a comprehensive manner 147 sociocultural and narrative variables and traits interoperable with existing DOD sociocultural-relevant frameworks. These capabilities provide users at the strategic, operational, and tactical levels with an interactive environment in which sociocultural observations and experiences can be collected and shared, concurrently promoting a collaborative community.

Designed to operate as a common knowledge repository, SC-GAP exhibits the potential to serve the entire DOD community. Users from different services and at different levels of military planning and operations can use SC-GAP to acquire and share data relevant to military operations. This possibility is not solely limited to the DOD, but can enrich non-DOD communities by enhancing their ability to gather and share pertinent data for efficient and effective coordination and performance. At the tactical level, SC-GAP possesses the capability to display minute details on every feature, such as a religious key site and host nation police station, generated by service member observations and experiences. These types of data can enhance tactical planning and operations by revealing potential military significance and illustrating local attitude toward U.S. presence and activities. At the operational level, SC-GAP delivers data imperative to planners and key decision makers for comprehending the overall operational environment and implementing that understanding into their planning in support of ongoing or future operations and campaigns. Key data, such as service member narratives that depict the sentiment of an area of operation during a specific Joint Phase, can assist the users at the operational level to analyze and determine whether the operational environment is prepared for the next Joint Phase. Finally, at the strategic level, SC-GAP enables planners and decision-makers of the DOD to gather and share pertinent sociocultural data for achieving national objectives. With a global footprint, the DOD can accumulate critical data through SC-GAP, which benefits not only the DOD itself, but also the whole government for further analysis, cooperation, and collaboration. SC-GAP, while its primary consumers belong to the DOD, can ultimately synchronize both the warfighting capabilities and efforts of various organizations to achieve a common objective through the application of joint knowledge.

B. PROPOSED IMPLEMENTATION PLAN

The current SC-GAP proof of concept, by its very nature, requires further development and advancement prior to its implementation as a DOD enterprise solution. For a successful completion, SC-GAP requires five ensuing phases, consisting of: Prototype Design; Prototype Development; Testing and Validation; Community Engagements; and Implementation, as shown in Figure 22.¹⁶⁸ These steps consist of key tasks required for enabling SC-GAP to effectively and efficiently collect and integrate data comprised of service member narratives with the greater Joint Force. Furthermore, the five phases will shape SC-GAP into a dynamic and collaborative sociocultural living repository for the DOD, ultimately enhancing the nation's armed forces' strategic performance.

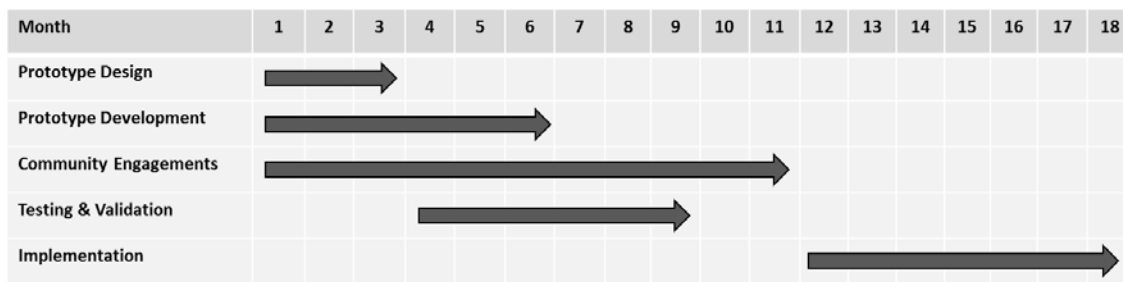


Figure 22. Proposed implementation plan illustrates the way-ahead of SC-GAP and the necessary phases for a successful implementation of SC-GAP¹⁶⁹

¹⁶⁸ Phases developed using information derived from “Key Phases of Software Development Projects,” Segue Technologies, last modified July 30, 2013, accessed May 16, 2015, <http://www.seguetech.com/blog/2013/07/30/key-phases-software-development-projects>; “SDLC Overview,” Tutorials Point, accessed May 16, 2015, http://www.tutorialspoint.com/sdlc/sdlc_overview.htm.

¹⁶⁹ Implementation Plan developed using information derived from Irma Azarian, “Key Phases of Software Development Projects”; “SDLC Overview.”

(1) Prototype Design

The primary objective of this phase is to further analyze and build upon the proof of concept design, an essential step for examining the functionality of SC-GAP.¹⁷⁰ This phase includes composing all of its features to enrich the overall user experience. Currently, SC-GAP consists of place-holding images and buttons to exhibit the potential of the User interface; however, this phase facilitates the coding and designing of these capabilities with appropriate resources and funding. Because the consumer of SC-GAP is the end user, all efforts must be centered on the user experience.¹⁷¹ This phase will take approximately three months for completion.

(2) Prototype Development

Upon completion of the prototype design, a field testable version will be developed. During the development phase, all proper measures will be taken to ensure a smooth test and validation process in preparation of the next phase.¹⁷² While the goal is to craft a working JavaScript-based interface, this phase will also consist of programming and launching mobile applications, intended to meet the needs of deployed service members who may be in austere environments away from computer stations and to promote the application of common knowledge across the enterprise. Only by producing a field testable version that can be applied to any operational environment can the prototype truly be tested and validated. This phase will take approximately six months.

(3) Community Engagements

Success of this phase depends on the buy-in by DOD components and units. Tasks of this phase include reaching out to various DOD units, marketing SC-GAP capabilities and their effects on warfighting, and triggering interests and will to implement SC-GAP among these different units. This phase should begin along with

¹⁷⁰ “Creating a Product Prototype,” Entrepreneur, accessed May 16, 2015, <http://www.entrepreneur.com/article/80678>.

¹⁷¹ Plan developed using information derived from Irma Azarian, “Key Phases of Software Development Projects.”

¹⁷² “How to Develop a Prototype,” Inc., last modified December 17, 2010, accessed May 16, 2015, <http://www.inc.com/guides/2010/12/how-to-develop-a-prototype.html>.

Phases 1 and 2. Our recommended units for engagements include Special Operations Command, each of the Theater Special Operations Commands, and United States Army Special Operations Command.¹⁷³ This phase will take approximately eleven months.

(4) Testing and Validation

With the prototype equipped with essential features for testing and validation, a test plan must be developed. The plan will include “the scope, approach, resources and schedule of intended test activities.”¹⁷⁴ Such activities include Factory Acceptance Testing, User Acceptance Testing, and Prototype Testing, during which issues will be identified, and feedback and observations will be gathered for further fine-tuning.¹⁷⁵ With the different types of testing and validation complete, as well as defect reports and feedback collected, SC-GAP requires modifications; these refinements will need to be reevaluated.¹⁷⁶ This phase will take approximately six months for completion.

(5) Implementation

Once those DOD units planning on employing SC-GAP are identified and the testing and validation process is complete, the last phase is to conduct the implementation process. This phase includes transferring SC-GAP products to the receiving units, developing a facility to operate the portal and to assist customers with any issues, educating and training users, and advertising SC-GAP to promote its usage among potential users.¹⁷⁷ This phase will take approximately seven months.

¹⁷³ Plan developed using information derived from “Guide to Marketing to the DOD,” U.S. Department of Defense, accessed May 17, 2015, <http://www.acq.osd.mil/osbp/sb/guide.shtml>; “How does a New Product Go through the Prototyping Process?” How Stuff Works, accessed May 16, 2015, <http://home.howstuffworks.com/product-prototyping-process3.htm>.

¹⁷⁴ “Test Plan,” accessed April 17, 2015, <http://softwaretestingfundamentals.com/test-plan>.

¹⁷⁵ “Acceptance Testing,” Acutest, accessed May 16, 2015, <http://acutest.co.uk/acutest/acceptance-testing-solution>; “How does a New Product Go through the Prototyping Process?”

¹⁷⁶ “SDLC Overview.”

¹⁷⁷ Plan developed using information derived from “System Deployment,” University of California Santa Cruz, accessed May 17, 2014, <http://its.ucsc.edu/ea/sdlc/sys-dep.html>.

C. LESSONS LEARNED

One lesson this capstone project captures is that the operational environment (OE) continues to evolve and transform. Factors that were either necessary or sufficient for victory in previous conflicts may no longer apply to today's OE; the center of gravity for conflict might have shifted and, along with it, the requisite factors for victory. The DOD must acknowledge this and carefully approach its OE by identifying the type of warfare, determining its desired state, recognizing its actual state, detecting the causes of the disconnect between the two states, understanding the existing and potential assets and capabilities, and developing solutions to bridge the gap.

SC-GAP represents one of many possible answers to bridging the gap that exists today. However, it alone is not the ultimate solution to winning battles or wars. Given the current shift toward population-centric warfare and the existing sociocultural gap, SC-GAP serves as a tool that enables the DOD to advance its sociocultural knowledge of its OE and their populations by synchronizing all DOD efforts through a joint approach. While various factors determine success of military operations, equipping the DOD with a common, shared repository, coupled with service member narratives, will move the DOD toward success in today's OE.

APPENDIX A. SC-GAP USER GUIDE

This user guide for SC-GAP shows you how to navigate through SC-GAP, and it explains the core functionality of the user interface. This user guide was developed using screenshots from SC-GAP version 1.00.¹⁷⁸

To access SC-GAP, you first need to input the proper URL into your web browser. As of May 2015, the appropriate address is: <http://gaia.ern.nps.edu/npsviewer/scgap.html>. The link will first take you to an authentication screen where you will input your appropriate credentials.

To access SC-GAP, you will need to login using your NPS ArcGIS Online credentials for authentication, as shown in Figure 23. If you do not have an account, you will need to contact the Naval Postgraduate School's CORE Lab or Professor Kristen Tsolis to obtain one.

NPS App wants to access your account information

Sign In

esri

Username

djtoshn_NPS

Password

☐ Keep me signed in


SIGN IN

CANCEL

[Forgot username or password?](#)

[Sign in with your enterprise login](#)

NPS App developed by:



Naval Postgraduate School

Figure 23. ArcGIS online authentication screen

¹⁷⁸ These feature changes will include revising wording, adding features, and improving functionality for later versions of the interface.

Once your credentials have been verified, you will see the splash screen, as shown in Figure 24.



Figure 24. SC-GAP splash screen¹⁷⁹

The SC-GAP splash screen welcomes the user to the interface, explains its purpose, and invites you to share your experiences with the community of SC-GAP users. Click **OK** to close the splash screen.

A. INTERFACE FUNCTIONAL ZONES OVERVIEW

Figure 25 illustrates the default home screen. The interface is broken up into four functional zones with a hierarchical control system. Each zone is numbered accordingly in Figure 25. Zone 1 controls the options available in Zone 2; Zone 2 controls the options available in Zone 3; and Zone 3 controls what is displayed in the map window in Zone 4. Zone 1 is the mode selector to toggle between exploring the sociocultural data layers (Visualize) and sharing your story (Post.) Zone 2 is the feature selector, which changes the display between the different SC-GAP features of the standard view mode, narrative gallery, data dashboard, and reports window. Zone 3 is the table of contents window,

¹⁷⁹ Image created using data from reference 1 in Appendix C, Table 6.

which allows you to select the particular data layers that you want to interact with and display. Zone 4 is the map window where the data layers are displayed and interacted with.

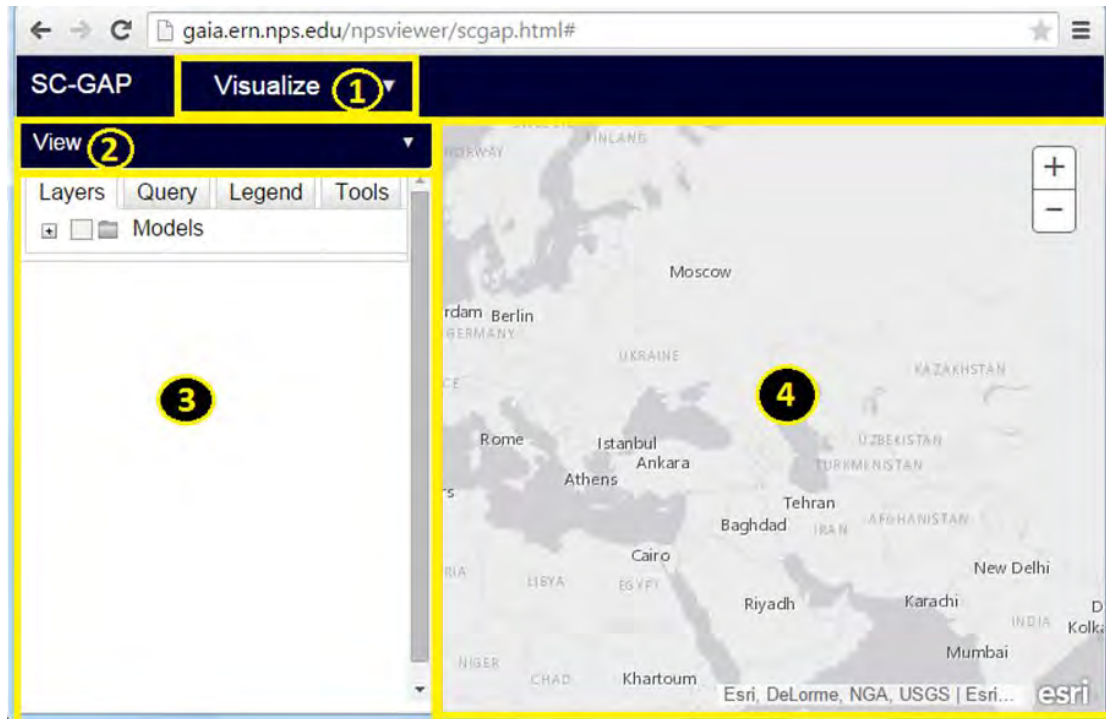


Figure 25. SC-GAP functional zones¹⁸⁰

Once you are at the home screen, you can select the map extent that you wish to see, as illustrated by Figure 26.

¹⁸⁰ Image created using data from reference 1 in Appendix C, Table 6.

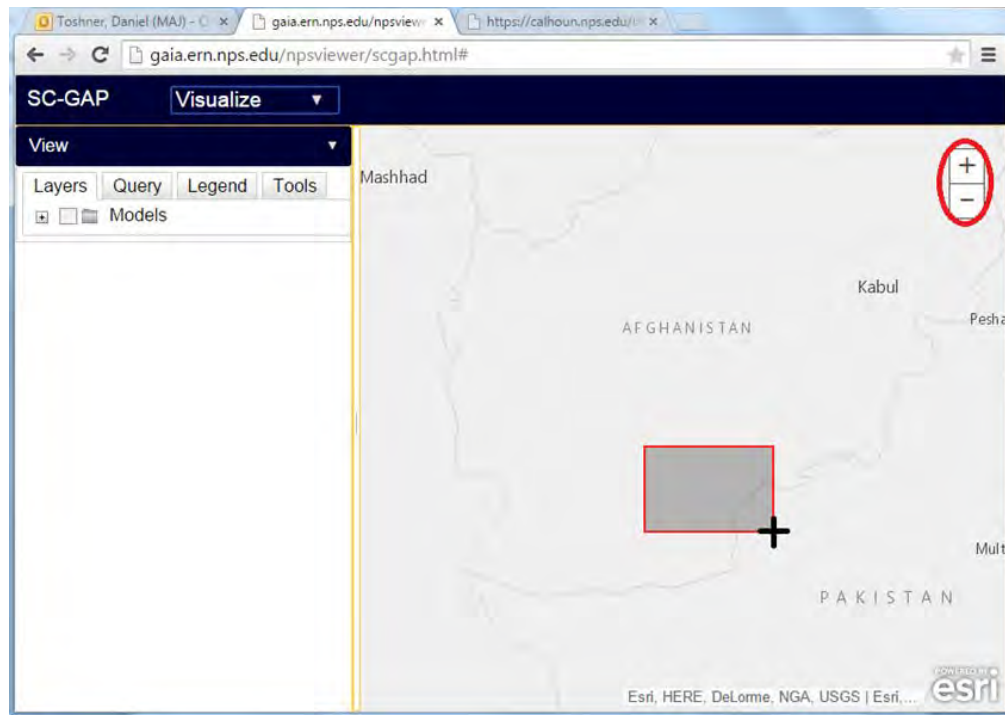


Figure 26. Controlling the extent of the map window¹⁸¹

There are three methods of zooming into the area you wish to see:

1. Double click with the mouse cursor to zoom in. Alternately, you may use the scroll wheel on your mouse (if equipped) to zoom in or out to the desired extent.
2. Hold the Shift key, click and drag to set the map extent box as shown in the center of the map window in Figure 26, then release to zoom in.
3. Use the zoom in/out selector in the upper right corner of the map window, circled in Figure 26 above. Clicking on the plus sign (+) zooms in and clicking on the minus sign (-) zooms out.

Next, select whether you want to explore the sociocultural data layers (“Visualize”) or share your story (“Post”).

¹⁸¹ Image created using data from reference 1 in Appendix C, Table 6.

B. EXPLORING SOCIOCULTURAL DATA LAYERS

To view data layers, click on the box circled in Figure 27 and select “Visualize.” Visualize is the default setting and may already be selected.

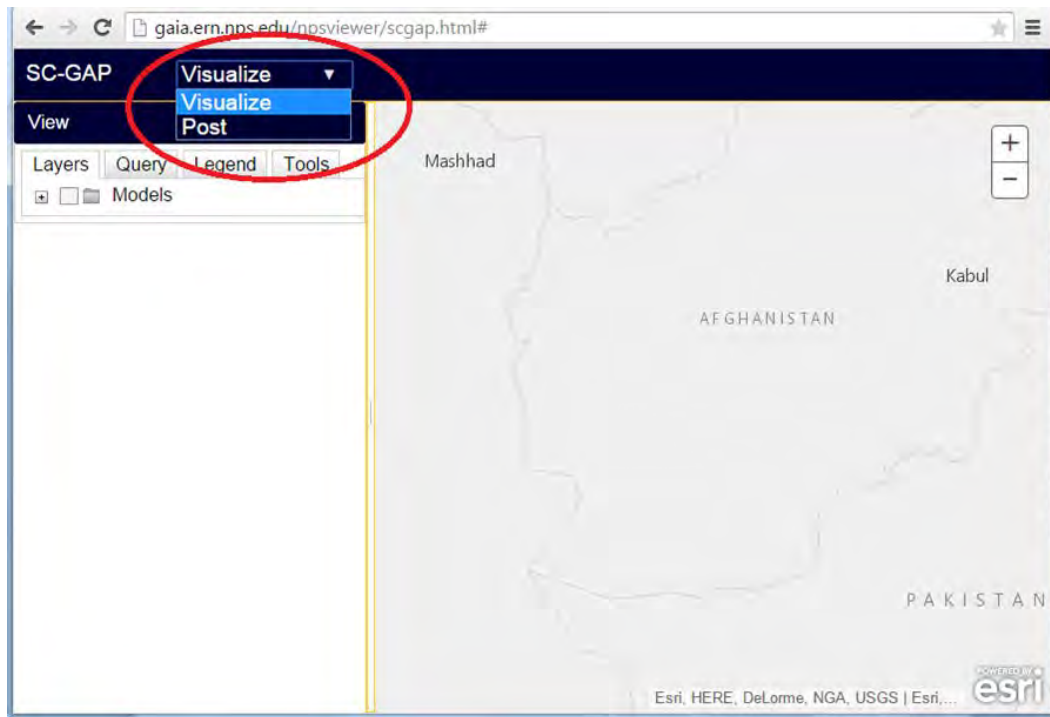


Figure 27. Selecting the visualize option in SC-GAP¹⁸²

Next, select the sociocultural data layers that you want to see, as illustrated in the following four figures. First, click on the plus (+) box—circled in Figure 28—next to “Model” to show the three sociocultural models.

¹⁸² Image created using data from reference 1 in Appendix C, Table 6.

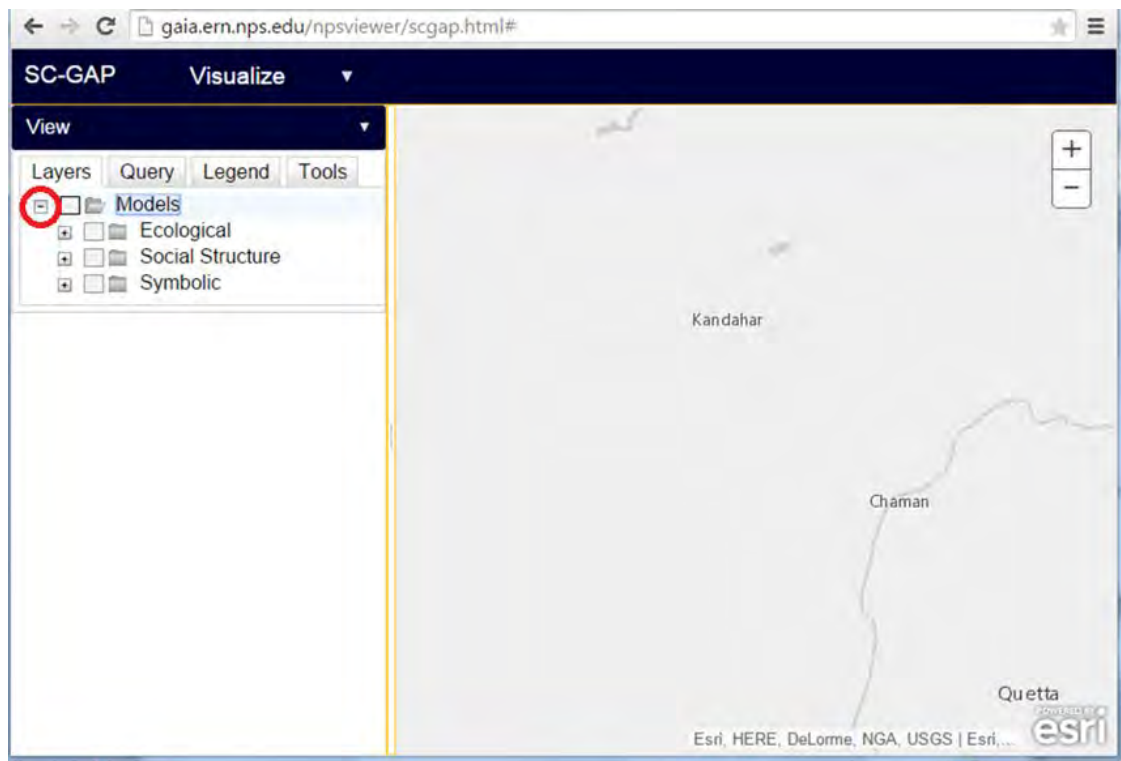


Figure 28. Selecting sociocultural data layers¹⁸³

Next, follow the process shown in Figure 29 to select the (1) sociocultural model, (2) sociocultural dimension, (3) sociocultural variable, and finally (4) the sociocultural trait to show the data layers available to display the selected sociocultural trait.

¹⁸³ Image created using data from reference 1 in Appendix C, Table 6.

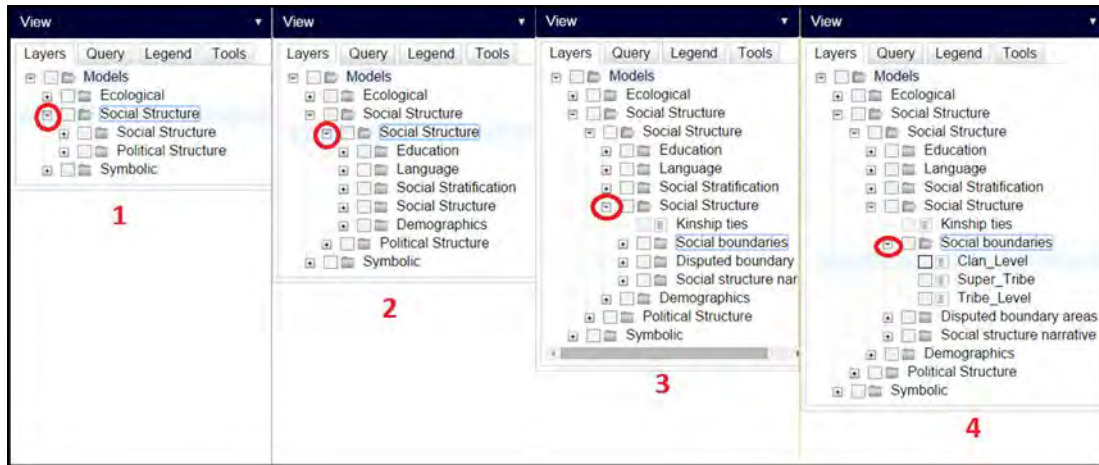


Figure 29. Selecting model, dimension, variable, and trait¹⁸⁴

Finally, click on one or more layers that you want to visualize. As shown in Figure 30, clicking the check box next to “Tribe_Level” selects a single data layer, in this case tribal boundaries.

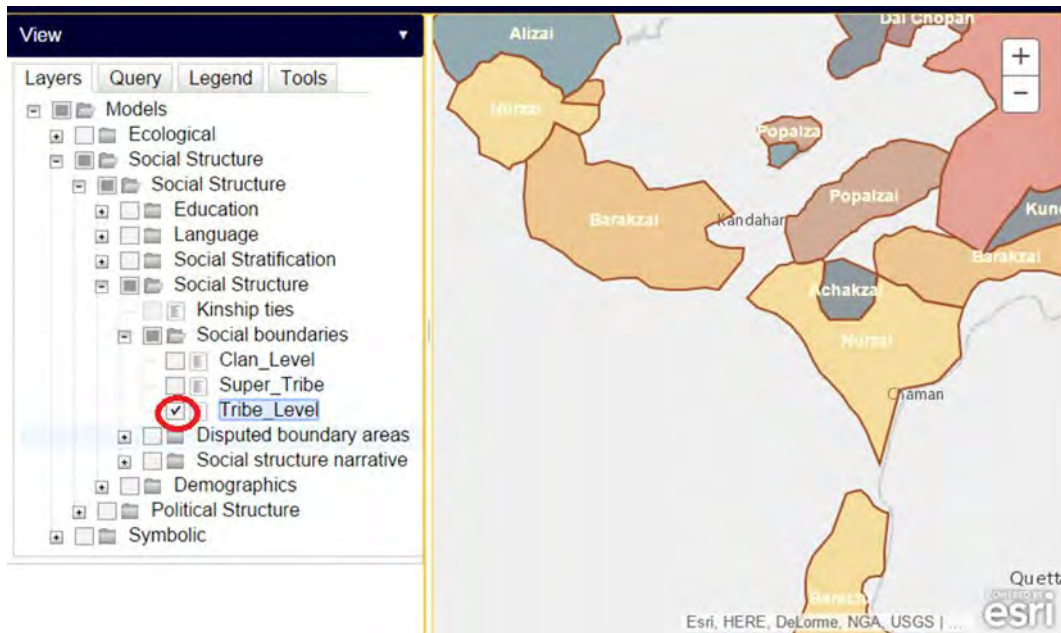


Figure 30. Selecting a single sociocultural data layer¹⁸⁵

¹⁸⁴ Models and dimensions derived from Salmoni and Holmes-Eber, *Operational Culture for the Warfighter: Principles and Applications*, 15.

Multiple related layers may also be selected simultaneously, as shown Figure 31. You may select all layers subordinate to a particular model, dimension, variable, or trait. Clicking on the circled box next to “Social Boundaries” selects all subordinate data layers as an example.

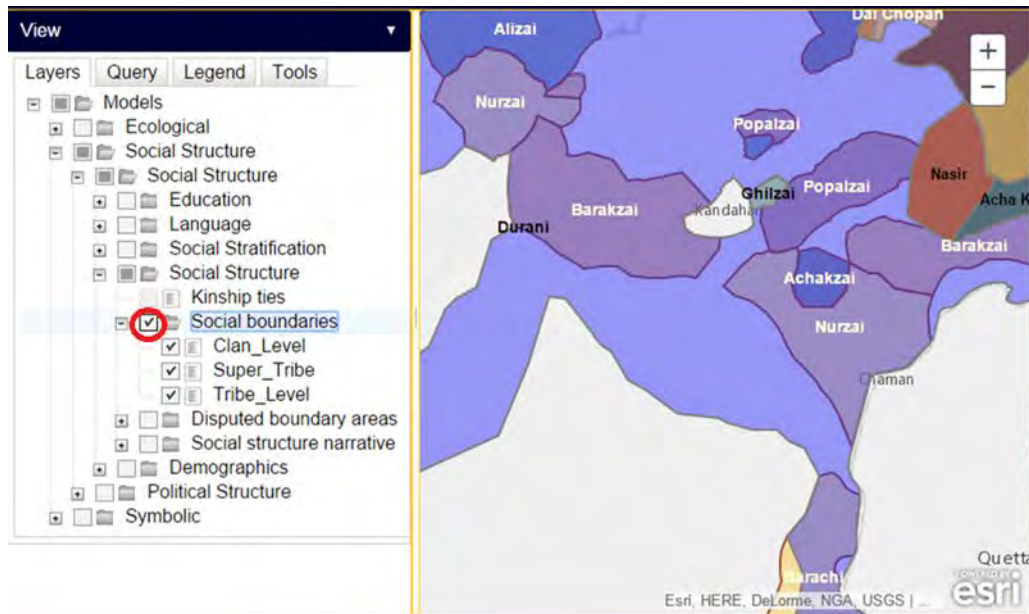


Figure 31. Selecting multiple sociocultural data layers¹⁸⁶

Once you have selected the data layers that you wish to display, you may explore the data using popups to display attributes of a single data feature, which may be a point, line, or polygon. Left-click on a specific data feature on the map to bring up a popup window, as shown in Figure 32.

¹⁸⁵ Image created using data from references 1 and 9 in Appendix C, Table 6.

¹⁸⁶ Image created using data from references 1, 7, 8, and 9 in Appendix C, Table 6.

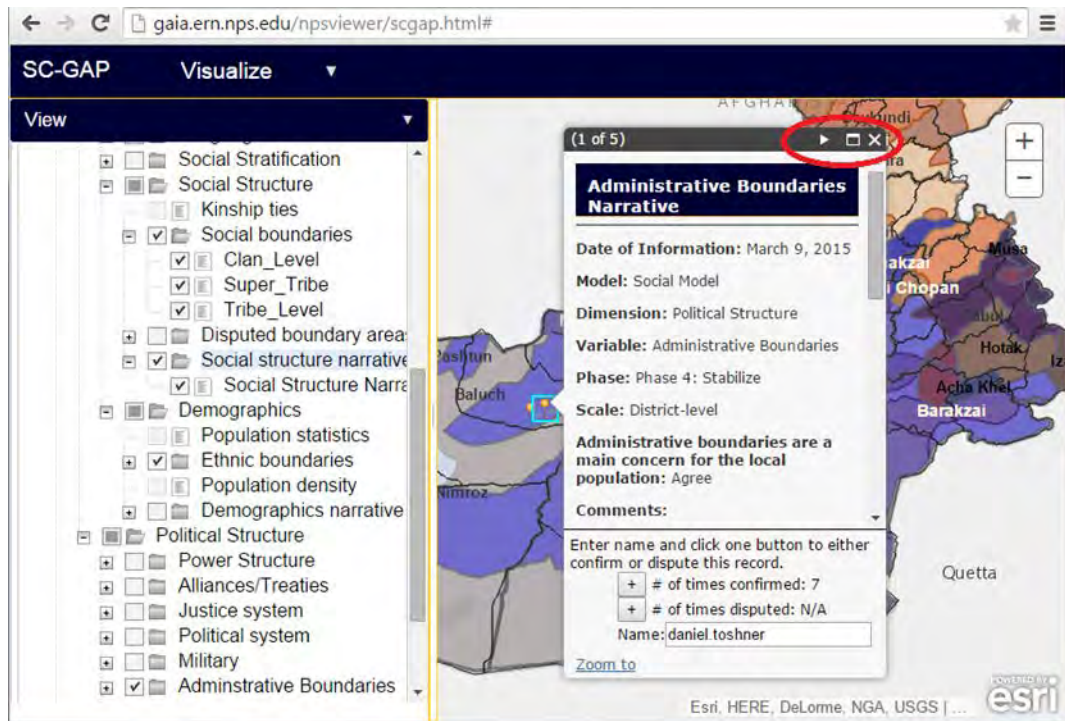





Figure 32. Exploring sociocultural data layers using popups¹⁸⁷

The arrow in the upper right corner of the popup  allows you to switch between different types of features that are layered on that point. In this case, there are five features that you can switch between using the arrow(s) as circled above. You can also maximize the popup window by selecting the window icon  or close the popup window by clicking on the “X” icon , both of which are also in the circled in Figure 32. The popup window includes the name of the feature, in this case “Administrative Boundaries Narrative,” along with attribute data of that feature, which you can scroll down through using the slider on the right side of the popup. The bottom of the popup shows the selection boxes allowing users to confirm or to dispute a particular data feature. SC-GAP crowdsources its data validation using this “confirm” or “dispute” functions of the popup.

(1) Visualization Tabs

¹⁸⁷ Image created using data from references 1, 3, 4, 6, 7, 8, and 9 in Appendix C, Table 6.

Other options for data visualization include a **Query** tab that allows the user to search for data in the data layers (non-functional in v. 1.00), a **Legend** displaying the symbology for displayed data, and a **Tools** tab (non-functional in v. 1.00) that allows the user to filter data according to certain criteria, as shown in Figure 33.

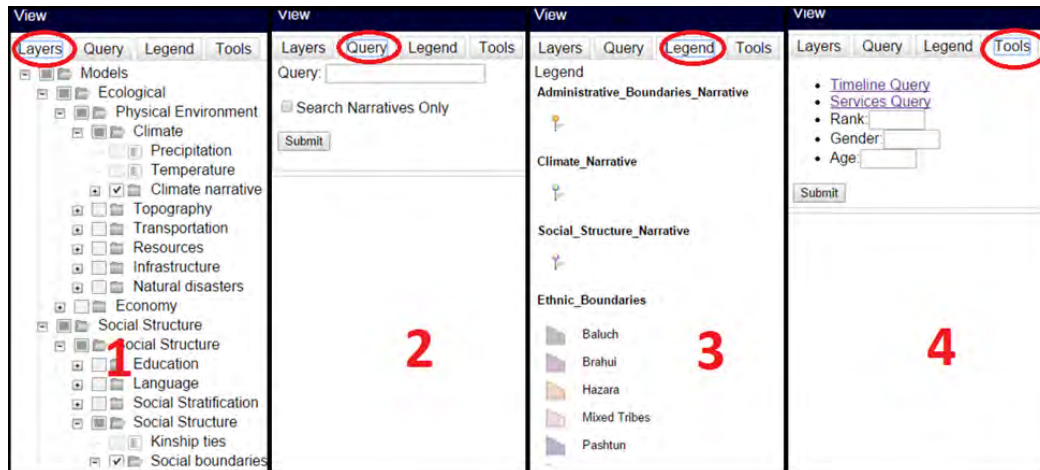


Figure 33. Data visualization tabs—layers, query, legend, and tools

(2) Other Features

Other features in the “Visualize” mode include a narrative gallery, data dashboard, and a reports window (all of these features are non-functional in v. 1.00.)

To access the other SC-GAP features, first click on “View” (default Zone 2) as circled in Figure 34. This will bring up a drop-down list allowing you to select the Narratives, Dashboard, or Reports features.

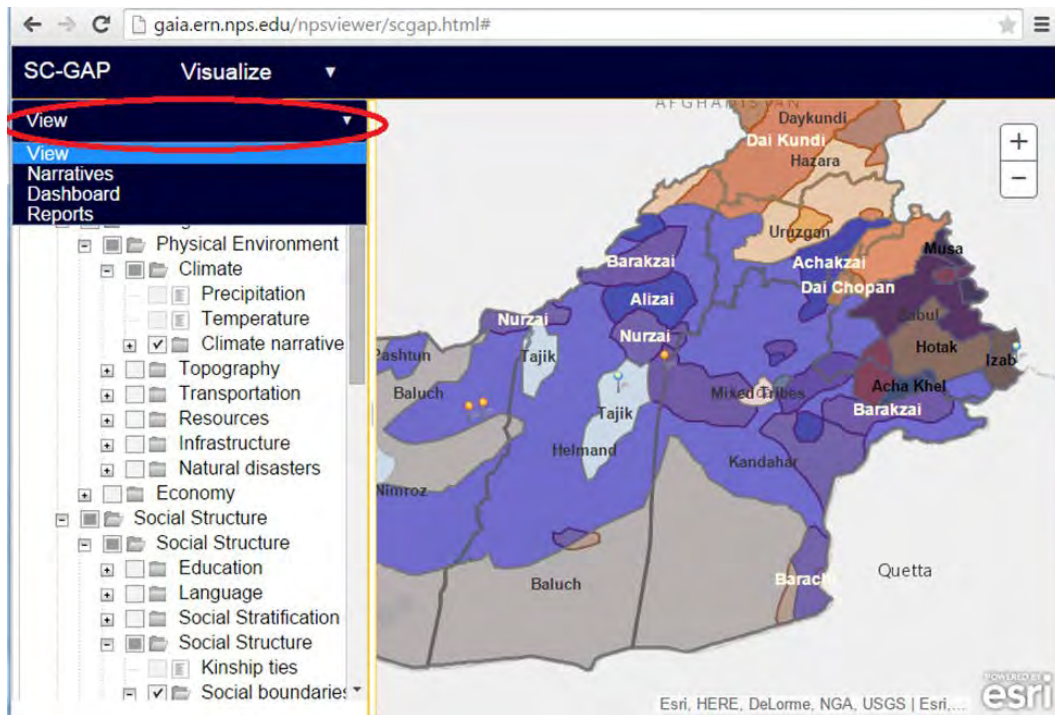


Figure 34. Selecting other SC-GAP features¹⁸⁸

The narrative gallery shown in Figure 35 will allow users to explore and interact with just the narrative data layers consisting of service members' stories. This feature is not functional in the current version (v. 1.00) of SC-GAP.

¹⁸⁸ Image created using data from references 1, 4, 6, 7, 8, and 9 in Appendix C, Table 6.

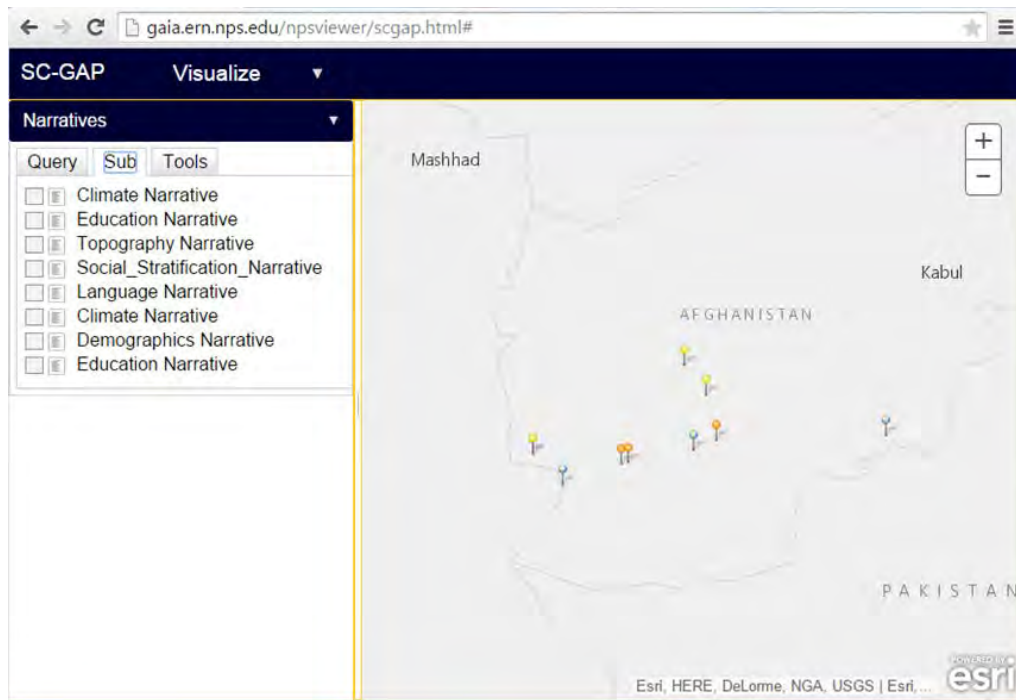


Figure 35. Narrative gallery feature¹⁸⁹

The data dashboard feature as shown in Figure 36 will allow users to display customizable charts and graphs derived from sociocultural data, providing a snapshot of what is depicted on the map based on selected criteria. This feature is not functional in the current version (v. 1.00) of SC-GAP.

¹⁸⁹ Image created using data from reference 1 in Appendix C, Table 6.

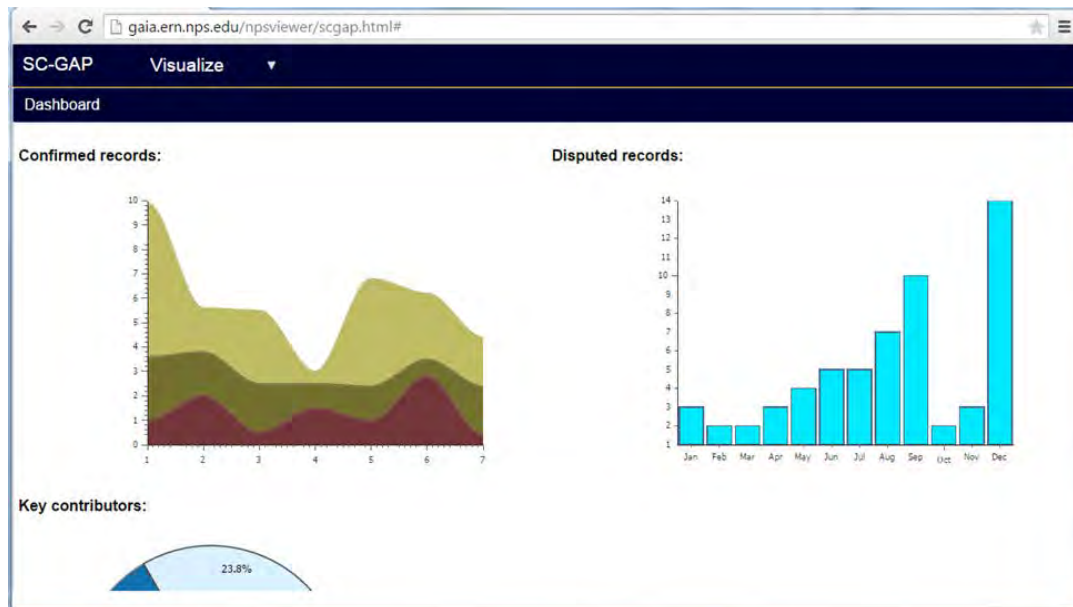


Figure 36. Data dashboard feature

The reports feature shown in Figure 37 will provide users a separate window in which to explore attribute data in depth, allowing users to query the data by selected attribute fields and to run reports to show an overview of the data. This feature is not functional in the current version (v. 1.00) of SC-GAP.

SC-GAP Visualize

Reports

Report Criteria

Trait:

Value:

Location: Kandahar
Date: 2/13/2005
Service: Army
Unit: 82nd
Rank: SFC

View	Date of Info	Service	Unit	Rank	Gender	Location	Model	Dimension	Variable	Jc
X	13-Feb-05	Army	82nd ABN DIV	E-7	M	Kandahar	Social	Social Structure	Education	Phase 4: Stab
<input type="checkbox"/>	21-Sep-12	Army	82nd ABN DIV	O-2	M	Jalalabad	Social	Social Structure	Ethnic Boundaries	Phase 4: Stab
<input type="checkbox"/>	3-Mar-12	Army	82nd ABN DIV	O-2	M	Herat	Ecological	Physical Environment	Geographic Choke Points	Phase 4: Stab
<input type="checkbox"/>	23-Nov-12	Army	82nd ABN DIV	E-4	F	Herat	Social	Political Structure	Organizations	Phase 4: Stab
<input type="checkbox"/>	30-Jan-15	Army	82nd ABN DIV	O-5	M	Kabul	Ecological	Economy	Financial Systems	Phase 5: Enal
<input type="checkbox"/>	2-Sep-10	Army	82nd ABN DIV	O-2	F	Kandahar	Social	Political Structure	Shadow Structures	Phase 3: Don
<input type="checkbox"/>	21-Nov-12	Army	82nd ABN DIV	E-6	F	Mazar-i-Sharif	Symbolic	Beliefs & Symbols	Religions	Phase 4: Stab
<input type="checkbox"/>	14-Mar-03	Army	82nd ABN DIV	E-3	M	Kandahar	Social	Political Structure	Shadow Structures	Phase 2: Seiz
<input type="checkbox"/>	21-May-03	Army	82nd ABN DIV	O-2	M	Kandahar	Social	Political Structure	Shadow Structures	Phase 2: Seiz
<input type="checkbox"/>	13-Jul-07	Army	82nd ABN DIV	E-7	M	Kandahar	Social	Political Structure	Shadow Structures	Phase 3: Don
<input type="checkbox"/>	3-Dec-14	Army	82nd ABN DIV	O-4	M	Herat	Ecological	Physical Environment	Infrastructure	Phase 5: Enal

We've been dealing with the tribe encountered the tribe Pelientesque tempor accumsan nulla id ph Vivamus ante felis, s feugiat. In vitae justo luctus nunc est nec u Vivamus lobortis, nuri amet odio. Lorem ips consectetur. The tribe

Figure 37. Reports feature

C. SHARING YOUR STORY USING THE “POST” MODE

To share your story, first click on the box circled in Figure 38 and select “Post.”

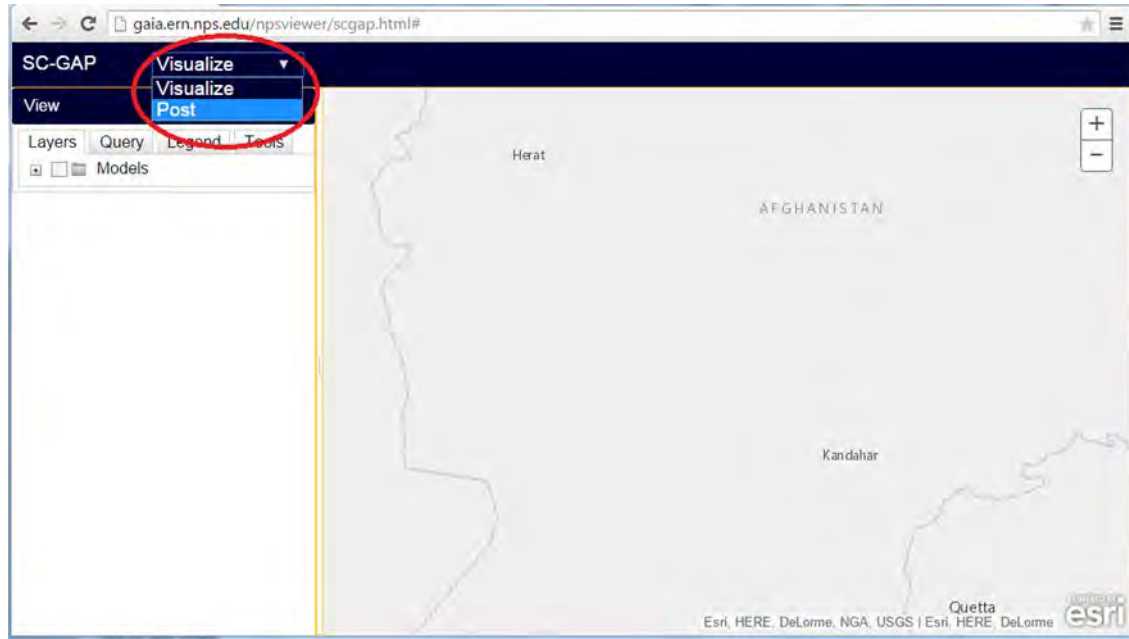


Figure 38. Selecting the post option in SC-GAP¹⁹⁰

This will change the interface as shown in the following figures:

Figure 39 shows the default screen after selecting the **Post** option. Key features on this screen are: 1) **Location** selector, which allows you to select the location of your story; 2) The list of sociocultural variables in SC-GAP, which allows you to describe your story by choosing the particular variable(s) that your story concerns; and 3) The map window, which displays both the sociocultural data layers selected back in **Visualize** mode and the location of your story.

¹⁹⁰ Image created using data from reference 1 in Appendix C, Table 6.

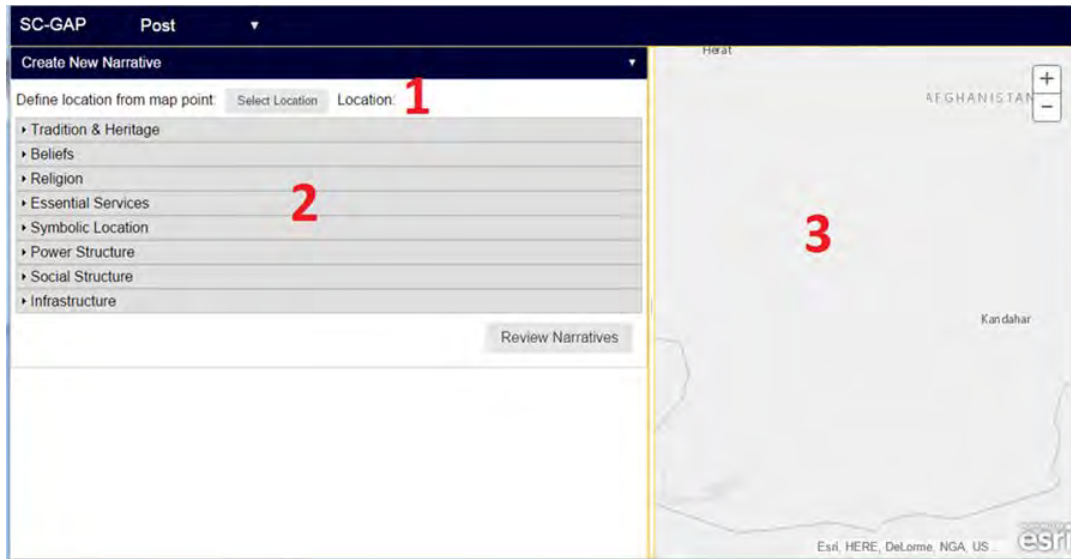


Figure 39. Default “Post” screen in SC-GAP¹⁹¹

If your map window does not appear, note that you might have to left-click and drag the window’s yellow dividing line to the left in order to make space for the map.

You may choose to first use the **Visualize** mode to select a few sociocultural data layers to view. This may help you think about the story you wish to tell or help you determine the location of your story on the map. You can then proceed with the **Post** mode.

To tell your story, you will need to designate a point on the map, as shown in Figure 40.

¹⁹¹ Image created using data from reference 1 in Appendix C, Table 6.

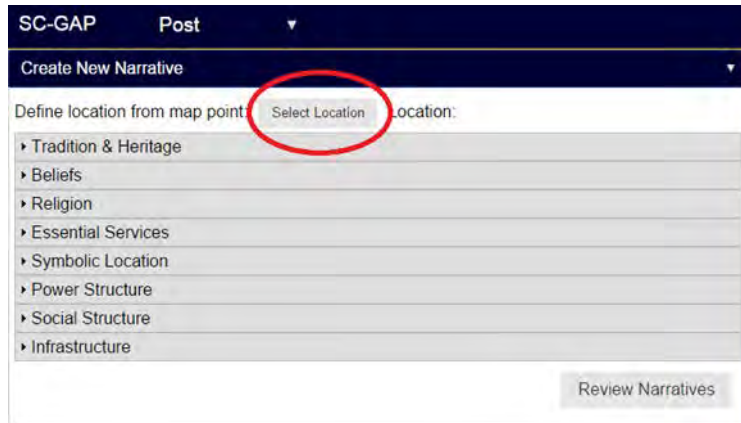


Figure 40. Location selection button

Click on the “Select Location” button as circled in Figure 40. This will maximize the map window, as shown in Figure 41.

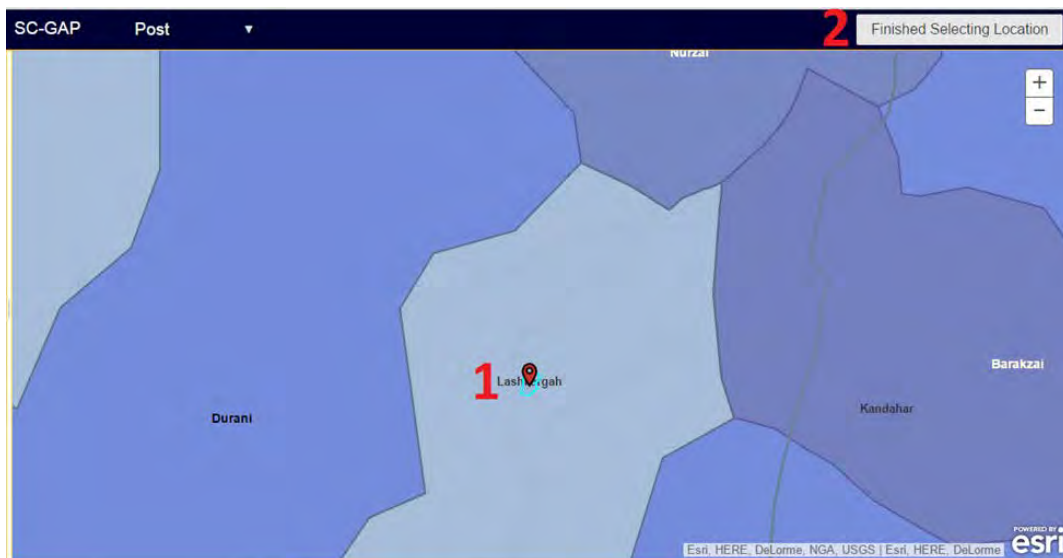




Figure 41. Designating your story’s location¹⁹²

To designate the location of your story, left-click on the desired location on the map, as illustrated in Figure 41. You may adjust the map extent by zooming in , zooming out , left-click and dragging to pan across the map, or just left-clicking on map

¹⁹² Image created using data from references 1, 6, 8, and 9 in Appendix C, Table 6.

locations until you are satisfied with the location you have designated. Click on the “Finish Selecting Location” button on the upper right corner of the map window to save your location. This takes you back to the main Post screen:

Figure 42 shows the main Post screen with your chosen location. Note that the Military Grid Reference System (MGRS) coordinates of your designated location appear at the top of the window next to the “Select Location” button, and your designated point appears in the map window on the right. The next step is to choose the sociocultural variable that helps describe your story.

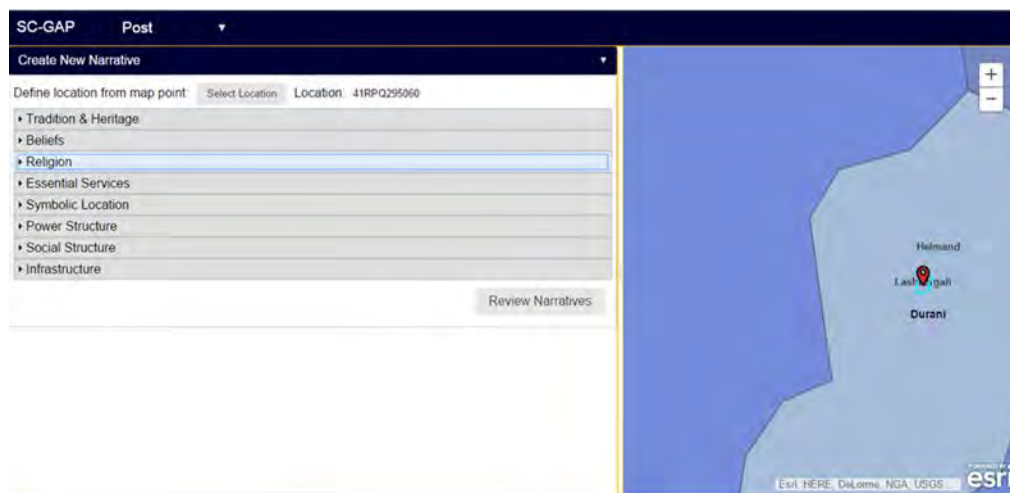


Figure 42. Post screen with location designated¹⁹³

Click on the desired variable in the list to expand the window and allow you to tell your story, as shown in Figure 43.

¹⁹³ Image created using data from references 1, 6, 8, and 9 in Appendix C, Table 6.

Figure 43. Expanded narrative window

We have selected Religion as an example, illustrated in Figure 43. First, choose the date of your experiences or observations. You may click on the dropdown arrow circled above and designate the date using the calendar function inherent in your web browser (does not currently work with all web browsers), or type the date in manually using the mm/dd/yyyy format. You may choose to also designate a specific time of day for your story, if your story concerns a specific event that you have witnessed or experienced.

The next step is to fill out some administrative data associated with your story, as shown in Figure 44.

Figure 44. Filling out administrative data

To fill out administrative data as shown in Figure 44, verify that the model, dimension, and variable are correct. If these fields do not automatically populate, select the most appropriate choices using the dropdown arrows in the selection boxes as shown. In the above example, we have designated the “Symbolic Model” (1), “Beliefs and Symbols” dimension (2), and the “Religions” variable.

Continue filling out the remainder of the administrative information by selecting:

- 4) Which phase of the Joint Phase model your story takes place in, which is Phase 4 in this example;
- 5) The human geography theme that your story aligns with, in this case Religions;
- and finally 6) The level of geospatial fidelity of your story, or in other words, whether your story pertains to a specific location, a wider area such as a village or city, or the country as a whole. We have selected Village level in this example.

After you have filled out the administrative data in the process above, answer the two rating scale questions to the best of your knowledge by clicking on the drop-down arrow in the text box, as shown in Figure 45.

Figure 45. Rating scale questions and comments¹⁹⁴

Click on the circled drop-down arrows to select the best response to the rating scale questions. The first question prompts you to agree or disagree with the statement that the variable (in this case Religion) is a main concern for the local population. The second rating scale questions whether the variable causes or contributes to grievances within the population. Answer both questions to the best of your ability; text boxes, highlighted in red above, allow you to comment on your answers to provide additional context that may be helpful for other users.

Once complete with the rating scale questions, fill in the remaining text boxes with your open-ended responses to the questions, which are specific to each variable. The final text box allows you to tell any part of your story not covered by your answers to the previous questions.

After filling out your responses, you can select other variables to tell your story using the same process outlined in the preceding steps. When you have completed telling your story, you are ready to review your story prior to submission.

As shown in Figure 46, after 1) filling out all of your responses in the text boxes shown, you have the option to 2) choose a file (PDF, picture, document, etc) to upload or

¹⁹⁴ Image created using data from references 1, 6, 8, and 9 in Appendix C, Table 6.

3) review your responses prior to submission. The following figures show each of these options.

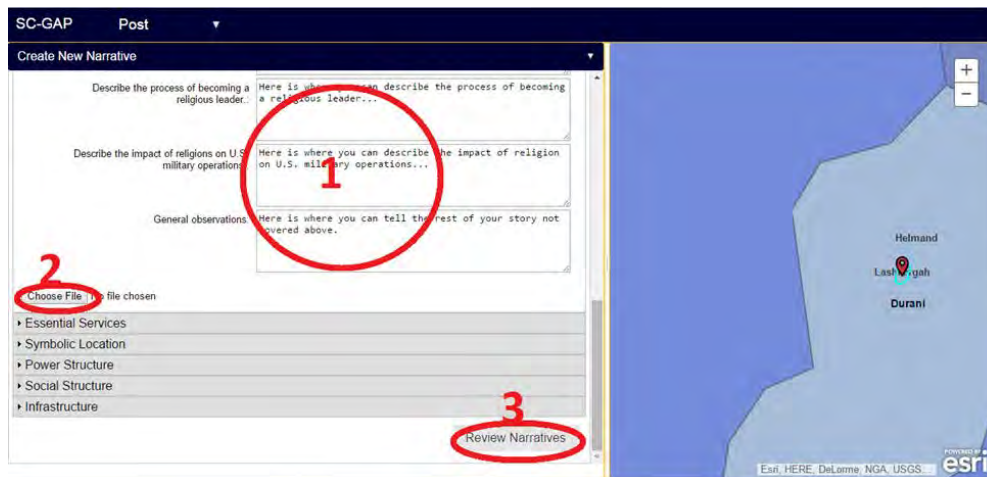


Figure 46. Open-ended questions and general observations¹⁹⁵

To upload a file, click on the “Choose File” button, which brings up a window allowing you to select the desired file, as shown in Figure 47. Once you have selected the file you wish to upload, click “Open” to close the selection window and the file name will appear next to the “Choose File” button, indicating that you are attaching the file to your story. You may attach a photo, multimedia file, or document to your story; however this feature is not available in the current version (v. 1.00).

¹⁹⁵ Image created using data from references 1, 6, 8, and 9 in Appendix C, Table 6.

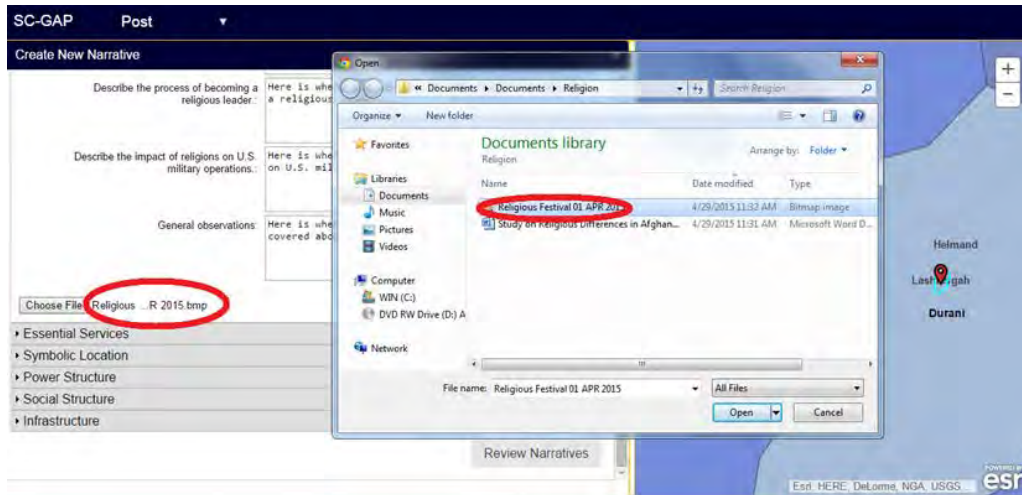


Figure 47. Attaching a file to your story¹⁹⁶

When reviewing your story, click on the circled check box (1) in Figure 48 to include the desired variable(s) in your submission. There is a check box for every variable, so you will need to uncheck the boxes for variables that you are not including in your story. The default setting for version 1.00 is for the box to be checked already for all variables. As shown in the circled region (2), you may click “Submit” to submit your story, “Back” to go back to correct any errors, or “Reset” to clear all form data. Caution: Clicking Reset will clear all data that you have just inputted, and you will need to start over.

¹⁹⁶ Image created using data from references 1, 6, 8, and 9 in Appendix C, Table 6.

SC-GAP Post

Create New Narrative

Include this narrative when submitting: ☒ 1

Date: 04/01/2015 Time: AM

Model: Symbolic Model

Dimension: Beliefs and Symbols

Variable: Religions

JPhase: Phase 4: Stabilize

HG_Themes: Religion

Level of geospatial fidelity: Village-level

Religion is a main concern for the local population.: Agree

(comments on above): Here is where you put comments regarding religion as a main concern for the local population...

Different types of religion lead to grievances.: (comments on above): Here is where you put comments regarding religion as a main concern for the local population...

How do religions affect the local population and its way of life?: Here is where you can tell your story about how religions affect the local population and its way of

Attachments:

Religious Festival 01 APR 2015.bmp

2 Submit Reset Back

Figure 48. Reviewing and submitting your story

After you click Submit, you will see the window shown above in Figure 49. At this point your story and attachments have been uploaded to the SC-GAP repository and you may now view your newly created data feature(s) by using the steps covered under **Viewing Sociocultural Data Layers**.

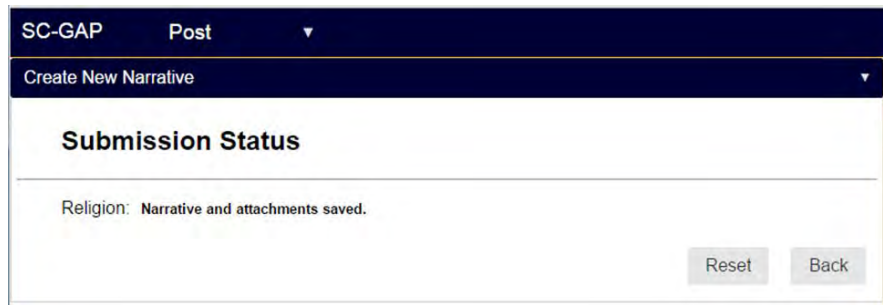


Figure 49. Successful submission

A few additional features will be accessible in “Post” mode by clicking on the circled drop-down arrow, as shown in Figure 50. Selecting “View” allows you to select data layers that you want to visualize, similar to Figure 28 in the “Visualize” mode. Similarly, selecting “Narratives” pulls up the narrative gallery (currently not functional in v. 1.00) as shown in Figure 35. Finally, selecting “Import” will allow you to upload ARC-GIS compatible geospatial data to SC-GAP, enabling users to populate sociocultural data layers using other software platforms. The Import feature is not functional in the current version of the SC-GAP. An Export feature will also be added to future versions to allow SC-GAP data layers to export an image of their data visualization or data from one or multiple layers, in shapefile or CSV format, thus expanding the ability of SC-GAP to support analytical or predictive modeling programs.

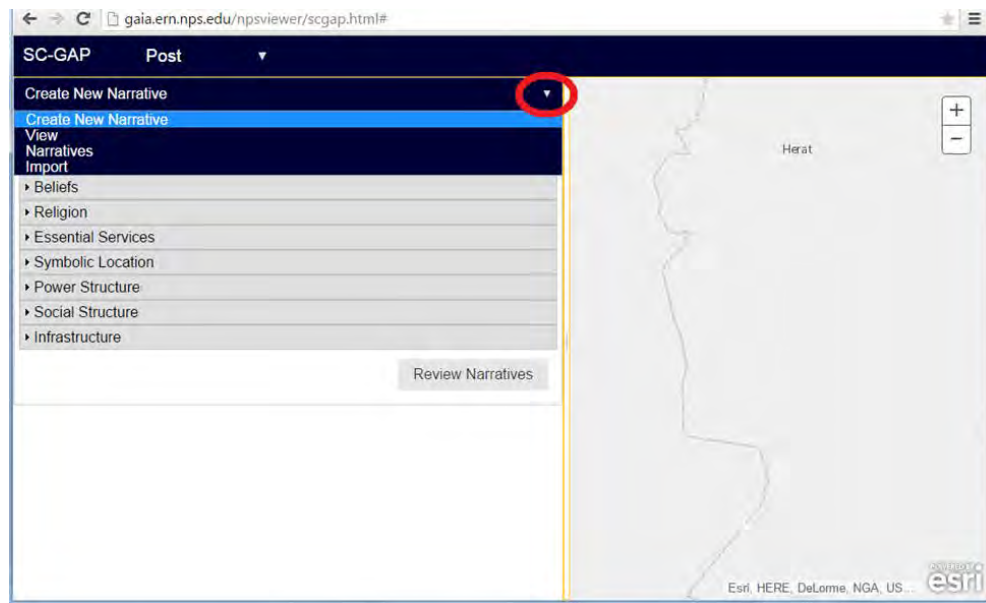


Figure 50. Accessing additional features in “Post” mode¹⁹⁷

¹⁹⁷ Image created using data from reference 1 in Appendix C, Table 6.

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APPENDIX B. SC-GAP SCENARIOS

A. PLATOON SERGEANT DURING A DEPLOYMENT

SFC Smith is a platoon sergeant of an infantry platoon nearing the end of its Train, Advise, and Assist (TAA) deployment to Afghanistan. His platoon has made great strides in encouraging cooperation between two neighboring tribes who previously held mutual grievances based on social structure and inequality. The process took a great deal of trial and error on his unit's part, and he wants to ensure that the incoming unit continues to make progress. SFC Smith decides to contribute his story to the greater body of sociocultural knowledge via the SC-GAP interface. He has used it in the past to find the locations and historical importance of key religious sites in his AO.

Since SFC Smith has used the SC-GAP interface before, his default location, map extent, and user information automatically populate when he logs in. With the intent of sharing his story, he selects the "post" option, which pulls up a popup with options for what type of narrative he wants to share. He selects a specific location on the map for his story, then clicks on the narrative category for social structure, which expands to show a series of short framing questions to establish the date of his experience, level of geospatial fidelity, and operational phase, as shown in Figure 51.

SC-GAP Post You are logged in as jmsmith. Logout

Create New Narrative

Social Structure

Date: 01/05/2015 Time: 12:00 AM

Model: Social Model

Dimension: Social Structure

Variable: Social Structure

JPhase: Phase 4: Stabilize

HG Themes: Demographic and Human Pop Measures

Level of geospatial fidelity: Village-level

Social structure is a main concern for the local population.
(comments on above):

Disagree
Neutral
Agree
Strongly Disagree
Strongly Agree
Not Applicable

There are grievances with the current social structure.
(comments on above):

How does the social structure affect the

Pashian Durani

Esri HERE DeLorme N esri

Figure 51. Completing the initial part of submitting a story in SC-GAP¹⁹⁸

SFC Smith answers two rating-scale questions regarding whether social structure is a main concern for the local population and to what extent the existing social structure contributes to grievances or conflict, briefly explaining his answer for each question. He then types in his narrative into the text blocks, prompted by the interface to focus his story on the military importance of his observations. He explains that when his unit got into theater, there seemed to be a disproportionate amount of civilian-on-civilian violence in a particular town in his AO. Upon further investigation and interaction with the local population, he discovered that the town was situated on a boundary between two predominant tribes in the region. The tribes had been engaging in a low intensity feud based on grievances brought about by one tribe having more influence in both the district and provincial government than the other, even though traditionally they had been seen as equals. SFC Smith's unit began building rapport with each of the tribes separately, which took considerable time and effort. Next, they proposed a series of council meetings between the leadership of the two tribes. The meetings were formal and cold at first, but eventually a mutual understanding and cooperative relationship was rekindled. Consequently, the level of violence in the town dropped substantially almost overnight.

¹⁹⁸ Image created using data from references 1, 3, 4, 7, 8, and 9 in Appendix C, Table 6.

This allowed SFC Smith's partnered Afghan National Security Forces (ANSF) unit to focus on other areas of the district in which the Taliban was attempting to reestablish a foothold. SFC Smith and his platoon leader recommended that the incoming U.S. Army unit continue with the council meetings to help prevent tribal grievances from reemerging, as shown in Figure 52.

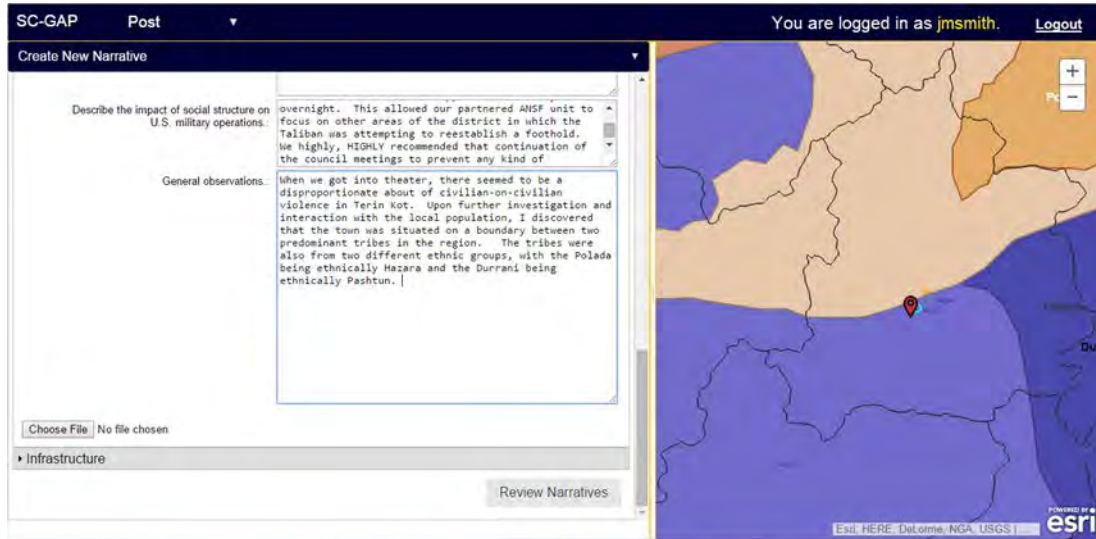


Figure 52. SFC Smith telling his story¹⁹⁹

SFC Smith finishes his social structure narrative and continues to input his narratives about administrative boundaries and education, two other subject areas in which he wants to share his sociocultural experiences. He clicks on the "Review Narratives" box to review his narratives, and subsequently, the option to submit his narratives, as shown in Figure 53.

¹⁹⁹ Image created using data from references 1, 3, 4, 7, 8, and 9 in Appendix C, Table 6.



Figure 53. Successful submission of a story in SC-GAP²⁰⁰

His narrative appears on the map in the location that he designated. He sees a few other narratives—submitted by his platoon leader and two of his squad leaders—on the map that contain other valuable lessons he had experienced but had not included in his narrative. Therefore, he decides to confirm the narratives by clicking on the “+” button next to the “# of times confirmed,” as shown in Figure 54; this process strengthens the validity of those narratives. Once complete, SFC Smith logs out of the system and returns to his duties for the day.

²⁰⁰ Image created using data from references 1, 3, 4, 7, 8, and 9 in Appendix C, Table 6.

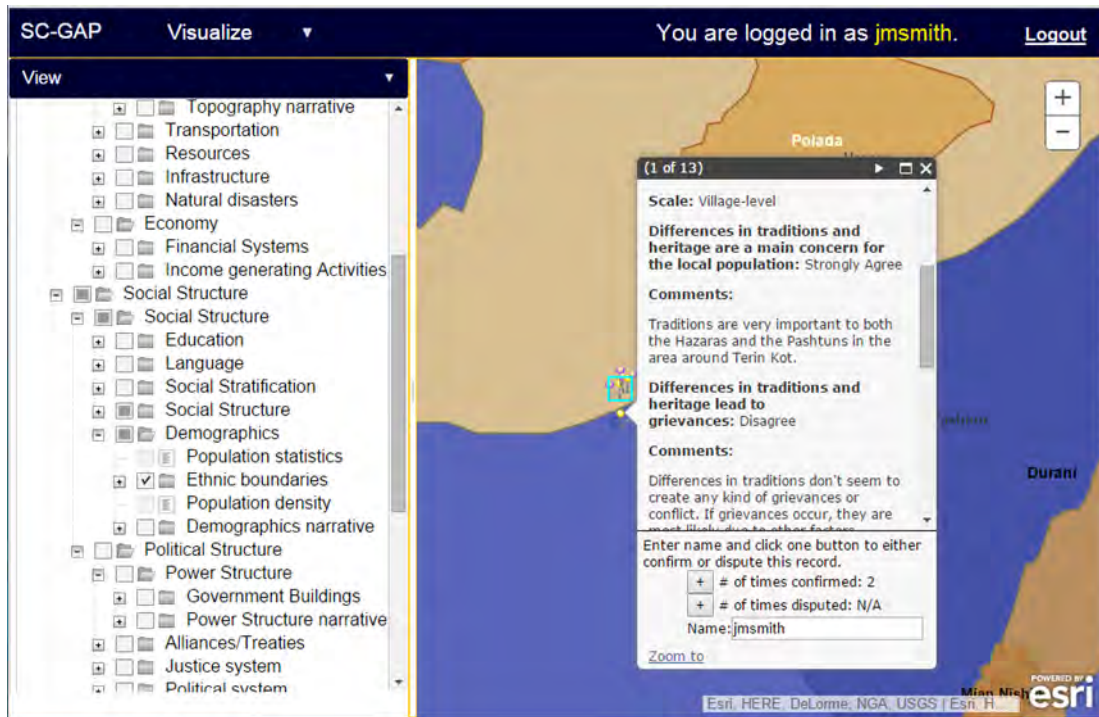


Figure 54. Confirming another user's story²⁰¹

B. ASSISTANT BRIGADE OPERATIONS OFFICER DURING PRE-DEPLOYMENT TRAINING

MAJ Jones is the assistant operations officer for his brigade, which has just received the mission to conduct TAA with an ANSF unit in the region formerly known as Regional Command – South (RC-South). MAJ Jones is unfamiliar with this region, as he and his unit were previously deployed to another part of the country. In order to gain better awareness and understanding on military-relevant sociocultural information about the region, he will use SC-GAP.

Since this is the first time that he has used the interface, he will need to input his user information into the system. After inputting his information, the interface displays the home screen with the default map extent of the entire world, as shown in Figure 55.

²⁰¹ Image created using data from references 1, 4, 7, 8, and 9 in Appendix C, Table 6.

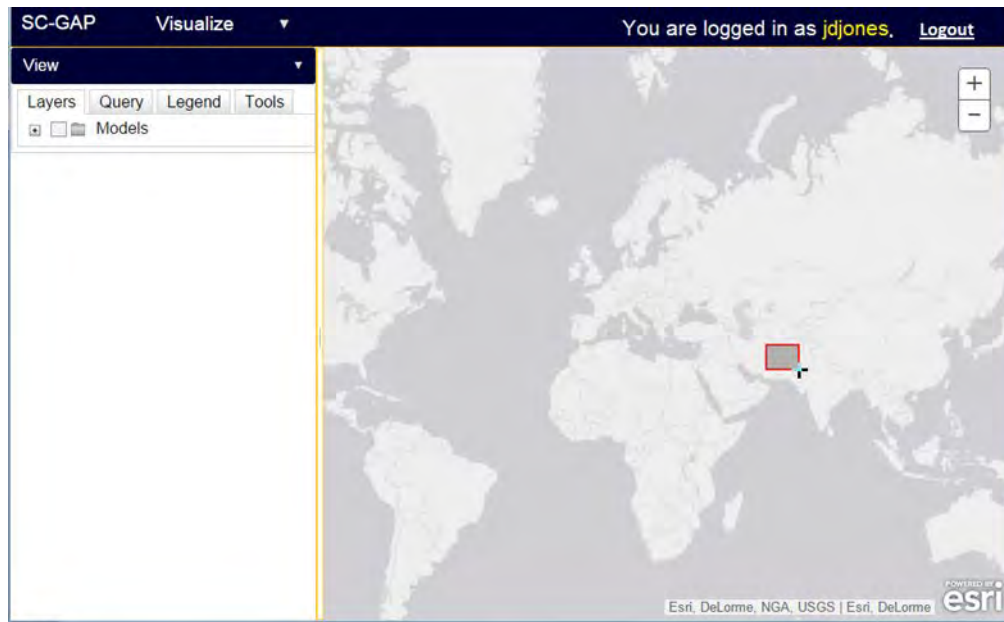


Figure 55. Zooming in from full map extent²⁰²

He then zooms into the region of Afghanistan that he wants to look at. Since he wants to view the narrative and non-narrative layers in the system, he selects the visualize option from the dropdown box, and then selects a few layers that he wants to explore. Since he is concerned about the tribal dynamics of the region, he selects the super tribe, tribe, and ethnic group layers along with the social structure and power structure narrative layers, as shown in Figure 56.

²⁰² Image created using data from reference 1 in Appendix C, Table 6.

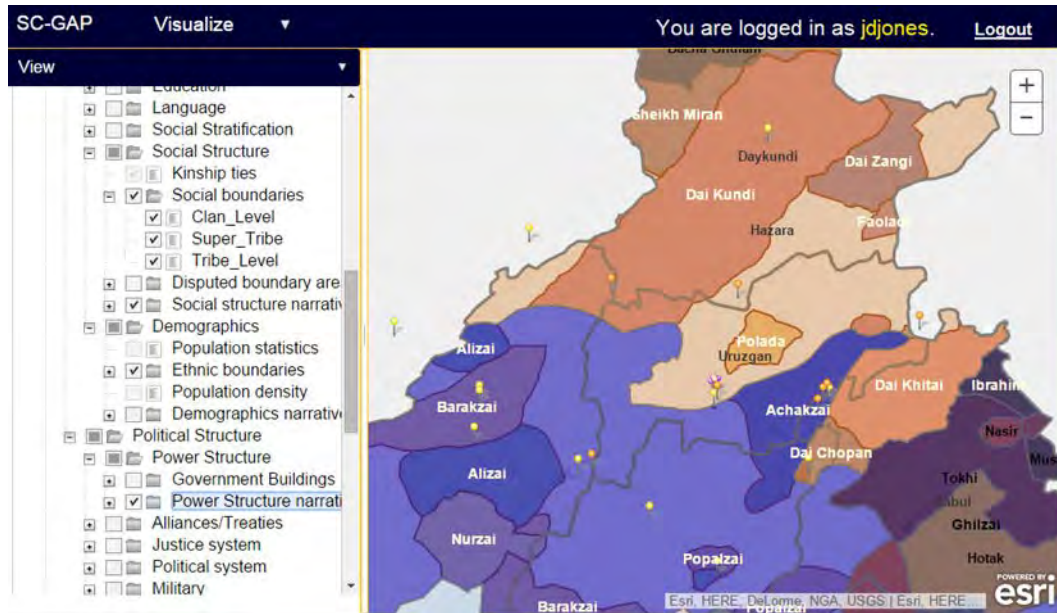


Figure 56. Viewing the desired map extent and data layers²⁰³

He sees that many of the social structure narratives fall along tribal boundaries, so he clicks on a few of them and finds out that there are grievances between two tribes due to one tribe having more influence in the local government than the other. One of the highest rated narratives—shown in Figure 57—was from a platoon sergeant regarding these grievances and how his unit was able to get around them by bringing some of the tribal leaders together in an open forum to discuss their issues.

²⁰³ Image created using data from references 1, 4, 6, 7, 8, and 9 in Appendix C, Table 6.

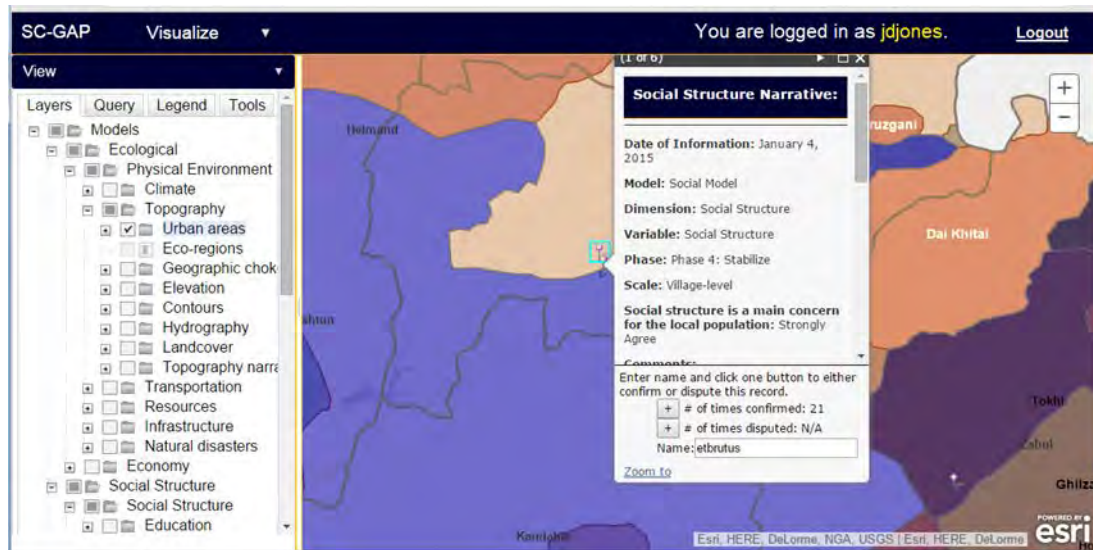


Figure 57. Popup for a highly confirmed story²⁰⁴

The series of meetings was making progress toward mending these grievances until the next unit took over the mission and did not continue the council meetings. MAJ Jones clicks on various narrative icons in the area to read the narratives at those locations and chooses to display only those narratives posted after the narrative regarding the successful series of council meetings. He finds that later narratives, including the one shown in Figure 58, indicate that the grievances between the tribes returned stronger than ever before.

²⁰⁴ Image created using data from references 1, 4, 6, 7, 8, and 9 in Appendix C, Table 6.

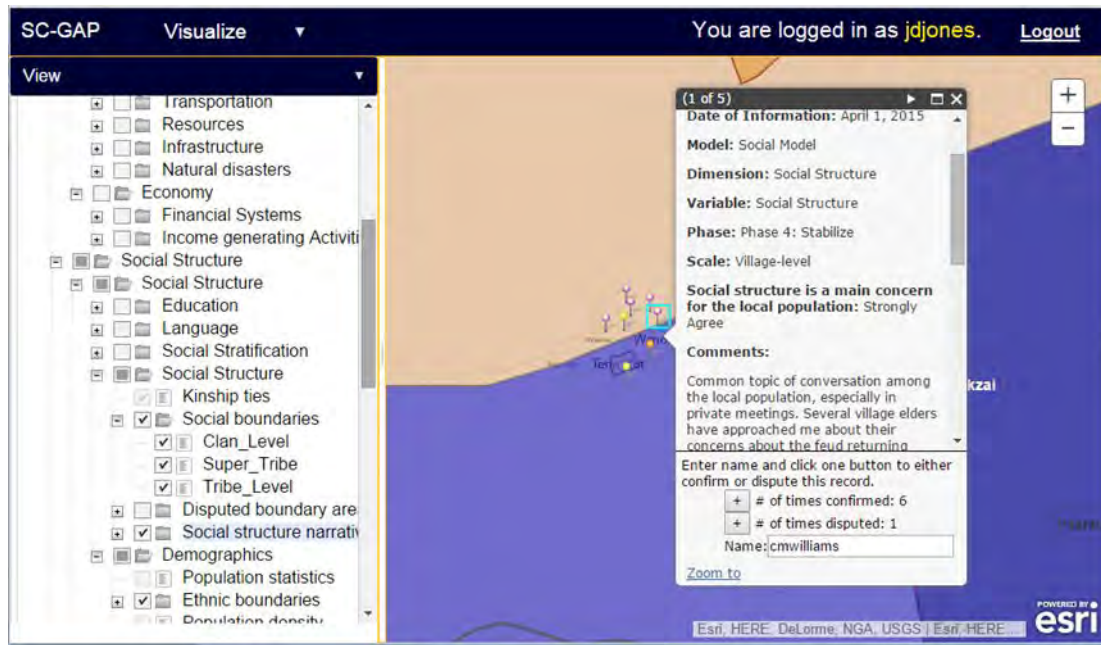


Figure 58. Popup for a later story describing the return of grievances²⁰⁵

Based on this insight, MAJ Jones identifies a potential societal fault line that needs to be mended to have long-term stability in the local area, as well as a potential course of action to recommend to his brigade commander. He also calls one of the battalion operations officers, MAJ Smith, whose area of operations would encompass those tribal areas to recommend that MAJ Smith and his operations section start looking at SC-GAP for sociocultural insights, in order to avoid the pitfalls from previous units that have rotated through that area, as well as to explore service member observations and experiences

These two vignettes together illustrate how the SC-GAP process can be integrated into military operations. In the first vignette, SFC Smith observed sociocultural indicators displayed by the local population in his AO, then processed those indicators with his other knowledge and experience to form his narrative, which he inputted into the SC-GAP repository. Other service members shared their experiences, providing added depth and context to SFC Smith's observations. In the second vignette, MAJ Jones viewed the

²⁰⁵ Image created using data from references 1, 4, 6, 7, 8, and 9 in Appendix C, Table 6.

narrative data in the repository in its geospatial and temporal context, distilling the knowledge he believed was important from the narratives. He then recommended a potential course of action for his Brigade Commander, which—if adopted—shows SC-GAP’s ability to enhance the cultural agility of military operations, and thus starting the cycle anew.

C. CONCLUSION

These two vignettes illustrate how the SC-GAP process can be integrated into military operations. In the first vignette, SFC Smith observed sociocultural indicators displayed by the local population in his AO, then processed those indicators with his other knowledge and experience to form his narrative, which he inputted into the SC-GAP repository. Other service members shared their experiences, providing added depth and context to SFC Smith’s observations. In the second vignette, MAJ Jones viewed the narrative data in the repository in its geospatial and temporal context, distilling the knowledge he believed was important from the narratives. He then recommended a potential course of action for his Brigade Commander, which—if adopted—shows SC-GAP’s ability to enhance the cultural agility of military operations, and thus starting the cycle anew.

APPENDIX C. SC-GAP FEATURE CLASSES AND GEOSPATIAL DATA SOURCES

This annex lays out the structure of the SC-GAP geodatabase and external data sources used for SC-GAP published web services. SC-GAP was built using a wide range of free data sources available on the open Internet. The authors of this capstone cannot vouch for the validity of data sources, but the sources were chosen specifically because they are openly shareable and free. Once fielded, SC-GAP would allow human sensors to further validate these data sources. The first five tables below break down the geodatabase feature classes into variable, sub-variable/trait, type of geometry (point, line, polygon, raster, table, or dataset), and the feature class name in the geodatabase. The tables refer to variables relating to the Physical Environment Model (Table 1), Economic Model (Table 2), Social Structure Model (Table 3), Political Structure Model (Table 4) and finally Beliefs and Symbols Model (Table 5), covering each of the *Five Operational Culture Dimensions*. An asterisk (*) denotes feature classes that incorporate geospatial data from external sources. Source information for each feature classes incorporating external data is compiled in Tables 6 and 7.

Table 1. SC-GAP feature classes—physical environment

SC-GAP Feature Classes: Physical Environment			
<u>Variable</u>	<u>Sub-variable/trait</u>	<u>Geometry Type</u>	<u>Name in geodatabase (* = Uses external data source)</u>
Climate	Precipitation	raster	N/A
	Temperature	raster	N/A
	Climate Narrative	points	Climate
Topography	Urban Areas	polygons	Urban_Areas*
	Eco-regions	polygons	Ecoregions*
	Geographic Choke Points	points	Geographic_Choke_Points*
	Elevation	raster	Elevation*
	Contours	lines	Countour_Lines*
	Hydrography	other	Hydrography
	Bodies of Water	polygons	Water_areas*
	Rivers and Streams	lines	WaterLines*

	Landcover	polygons	Landcover_RC_South*
	Topography Narrative	points	Topography_Narrative
Transportation	Road Network	dataset	Road_Network
	Bridges	points	Bridges
	Checkpoints	points	Check_Points
	Roads	lines	Roads*
	Railroads	dataset	Railroad
	Rail Lines	lines	Railroad_Lines*
	Railroad stations	points	Railroad_Stations
	Airports	points	Afg_Airports_Airfields*
	Mass Transit Network	dataset	Mass_Transit
	Bus Routes	lines	Bus_Routes
	Bus Stations	points	Bus_Stations
	Subway Lines	lines	Subway_Lines
	Subway Stations	points	Subway_Stations
	Transportation narrative	points	Transportation_Narrative
Resources	Oil and Gas Fields	polygons	Oil_Gas_Fields*
	Vegetation	polygons	Vegetation
	Construction Materials	table	Construction_materials
	Natural Resources	points	Natural_Resources
	Resources Narrative	points	Resource_Narrative
Infrastructure	Power Grid (Electrical)	dataset	Power_Grid
	Power Lines	lines	Power_lines
	Power Propagation	polygons	Power_propagation
	Power Substations	points	Power_substations
	Waste Management	dataset	Waste_Management
	Sewage Lines	lines	Sewage_line
	Trash Dumps	polygons	Trash_dumps
	Trash Collection Routes	lines	Trash_routes
	Waste Treatment Plants	points	Treatment_plants
	Water (distribution)	dataset	Water
	Water Lines	lines	Water_lines
	Water Towers	points	Water_Towers
	Wells	points	Water_wells
	Communications	points	Communications

	Cellular Propagation	polygons	Cell_propagation
	Relay Stations	points	Cell_relay_stations
	Cellular Towers	points	Cell_towers
	Radio Stations (Terrestrial)	points	Radio_Broadcasting_Station
	Radio Propagation (Terrestrial)	points	Radio_Propagation
	Telephone Lines	lines	Telephone_lines
	TV Stations (Terrestrial)	points	TV_broadcasting_station
	TV Propagation (Terrestrial)	polygons	TV_propagation
	Infrastructure Narrative	points	Infrastructure_Narrative
Natural disasters	Natural Disasters	dataset	Natural_Disasters
	Geologic Faults	lines	Geographic_Fault_Lines*
	Affected areas	points	Natural_disaster_events
	Vulnerable areas	polygons	Vulnerable_areas
	Earthquake Hazard Frequency	raster	Global_Earthquake_Hazard_Freq*
	Disease	dataset	Disease
	Disease Events	points	Disease_event
	Disease-affected Areas	polygons	Disease_affected_areas
	Natural Disasters Narrative	points	Natural_Disaster_Narrative

Table 2. SC-GAP feature classes—economic

SC-GAP Feature Classes: Economic			
<u>Variable</u>	<u>Sub-variable/trait</u>	<u>Geometry Type</u>	<u>Name in geodatabase (* = Uses external data source)</u>
Financial Systems	Currency Exchange	table	Currency_Exchange
	Financial Institutions	points	Banking
	Financial Systems Narrative	points	Financial_System_Narrative
Income generating Activities	Factories	points	Factories
	Employment Stats	table	Employment_Stats
	Cultivated Areas	polygons	Cultivated_Areas*
	Cultivated areas (Just in RC-South)	polygons	Cultivated_Areas_RC_South*
	Irrigated Areas	polygons	Irrigated_Areas*
	Oil and Gas Wells	points	Oil_Natural_Gas_Wells*
	Income Generating	points	Income_Generating_Activities_Narrative

	Activities narrative		
	Income Generating Activities	polygons	household_income_generating_activities*

Table 3. SC-GAP feature classes—social structure

SC-GAP Feature Classes: Social Structure			
<u>Variable</u>	<u>Sub-variable/trait</u>	<u>Geometry Type</u>	<u>Name in geodatabase (* = Uses external data source)</u>
Education	Schools	points	Schools
	Education Statistics	table	Education
	Education Narrative	points	Education_Narrative
Language	Languages	polygons	Languages
	Language Narrative	points	Language_Narrative
Social Stratification	Neighborhoods	polygons	Neighborhoods
	Social Stratification Narrative	points	Social_Stratification_Narrative
Social Structure	Kinship Ties	table	Kinship_Ties
	Social Boundaries	dataset	Social_Boundaries
	Clan-level Boundaries (or equivalent)	polygons	Clan_Level*
	Super Tribe-level Boundaries (or equivalent)	polygons	Super_Tribe*
	Tribe-level Boundaries (or equivalent)	polygons	Tribe_Level*
	Disputed Boundary Areas	polygons	Disputed_Boundary_Areas*
	Social Structure Narrative	points	Social_Structure_Narrative
Demographics	Population Statistics	table	Population_Statistics
	Ethnic Boundaries	polygons	Ethnic_Group*
	Population Density	dataset	Population_Density
	Population Density (Province)	polygons	Province_Population_Density*
	Population Density (District)	polygons	District_Population_Density*
	Demographics Narrative	points	Demographics_Narrative

Table 4. SC-GAP feature classes—political structure

SC-GAP Feature Classes: Political Structure			
<u>Variable</u>	<u>Sub-variable/trait</u>	<u>Geometry Type</u>	<u>Name in geodatabase (* = Uses external data source)</u>
Power Structure	Government Buildings	points	Government_Buildings
	Power Structure Narrative	points	Power_Structure_Narrative
Alliances/ Treaties	Local Alliances	table	Local_Alliances
	Alliances or Treaties Narrative	points	Alliances_or_Treaties_Narrative
Justice system	Court System	dataset	Courts
	Civil Courts	points	Civil
	District Courts	points	District
	Municipal Courts	points	Municipal
	Type of Justice System	table	Type_of_Justice_System
	Legitimacy of Justice System	table	Legitimacy_of_Justice_System
	Justice System Narrative	points	Justice_System_Narrative
Political System	Political Parties	dataset	Political_Parties
	Political Party Buildings	points	Political_Party_Buildings
	Primary Political Party Affiliation	polygons	Primary_Political_Party_Affiliation
	Political districts	polygons	Political_Districts
	Political corruption	table	Political_Corruption
	Political Corruption Incidents	points	Significant_Events
	Local Law Enforcement	dataset	Local_Law_Enforcement
	Local Law Enforcement Jurisdiction	polygons	Law_Enforcement_Jurisdiction_Area
	Police Checkpoints	points	Police_Checkpoints
	Police Coverage Area	polygons	Police_Coverage_Area
	Police Stations	points	Police_Stations
	Local Law Enforcement Narrative	points	Local_Law_Enforcement_Narrative
	Armed Conflict Events	points	Afghan_ACLED*
	Political System Narrative	points	Political_System_Narrative

Military	Host Nation Military Bases	polygons	Military_Bases
	U.S. Military Bases	points	US_Military_Bases*
	Military Narrative	points	Military_Narrative
Administrative Boundaries	National Boundary	polygons	Nation_Boundary_AFG*
	Province/State Boundary	polygons	Province_or_State_Boundary*
	District/County Boundary	polygons	District_or_County_Boundary*
	Boundary Discrepancies	polygons	Boundary_Discrepancies_between_Official_and_Unofficial
	Administrative Boundaries narrative	points	Administrative_Boundaries_Narrative
	District Centers	points	District_Centers*
Organizations	NGO Locations	points	Nongovernmental_Organization
	IGO Locations	points	International_Governmental_Organization
	Groups or Associations	table	Organizational_Groups_and_Associations
	Organizations Narrative	points	Organizations_Narrative
Shadow Structures	Black Markets	points	Black_Markets
	Criminal Activity	dataset	Criminal_Activity
	Crime (events)	points	Criminal_Event
	Crime (Areas or Hot Spots)	polygons	Crime_Areas_and_Hot_Spots
	Smuggling or Trafficking Routes	lines	Smuggling_and_Trafficking_Routes
	Shadow Structures Narrative	points	Shadow_Structures_Narrative
Essential Services	Emergency Services	dataset	Emergency_Services
	Ambulance Coverage	polygons	Ambulance_Coverage
	Ambulance/EMS Facilities	points	Ambulance_or_EMS_Facilities
	Fire Stations	points	Fire_Stations
	Fire Department Coverage	polygons	Fire_Department_Coverage
	Health Facilities	points	Health_Facilities*
	Essential Services Narrative	points	Essential_Services_Narrative

Table 5. SC-GAP feature classes—beliefs and symbols

SC-GAP Feature Classes: Beliefs and Symbols			
<u>Variable</u>	<u>Sub-variable/trait</u>	<u>Geometry Type</u>	<u>Name in geodatabase (* = Uses external data source)</u>
Religions	Religious Boundaries	dataset	Religion_Boundaries
	Predominant Religion	polygons	Predominant_Religions*
	Places of Worship	points	Worship_Places
	Religions Narrative	points	Religions_Narrative
Intellectual Expression or Folklore	Museums	points	Museums
	Music Venues	points	Music
	Art Galleries or Studios	points	Art
	Theaters or Performing Arts Centers	points	Theaters_or_Performing_Arts_Center
	Ceremonies	points	Ceremonies
	Architectural Sites	points	Architectural_Sites
	Handicrafts	points	Handicrafts
	Intellectual Expression or Folklore Narrative	points	Intellectual_Expression_or_Folklore_Narrative
Traditions and Heritage	Traditions and Heritage	table	Tradition_and_Heritage
	Traditions and Heritage Narrative	points	Traditions_and_Heritage_Narrative
Semantics	Semantics	table	Semantics
	Semantics Narrative	points	Semantics_Narrative
Symbolic Locations	Key Sites	dataset	Key_Symbolic_Sites
	Key Historical Sites	points	Historical_Sites*
	Key Religious Sites	points	Religious_Sites
	Symbolic Locations Narrative	points	Symbolic_Locations_Narrative
Beliefs	Beliefs Narrative	points	Beliefs_Narrative
Values	Values Narrative	points	Values_Narrative

Table 6. List of external data sources used to create SC-GAP screenshots

External Geospatial Data Sources Used for SC-GAP Screenshots		
Ref. #	Feature Layer	Data Source Information
1	Base Map	World Light Gray Base [Computer File]. Redlands, CA: Environmental Systems Research Institute (ESRI), 2015. Available: ArcGIS Online < http://www.arcgis.com/home/item.html?id=ed712cb1db3e4bae9e85329040fb9a49 > (Accessed April 30, 2015)

2	Geographic Choke Points (Point)	Afghan Mountains and Mountain Passes, Afghanistan [Computer File]. GeoCommons using data from CIA World Factbook, 2008. Available: GeoCommons < http://geocommons.com/overlays/16170 > (Accessed January 22, 2015)
3	District or County Boundaries (Polygon)	Afghanistan Administrative Areas Level 2 [Computer File]. Global Administrative Areas (www.gadm.org), 2011. Available: DIVA-GIS < http://www.diva-gis.org/gdata > (Accessed January 22, 2015)
4	Ethnic Boundaries (Polygon)	Afghan Tribal Shapefiles V_1 [Computer File]. Monterey, CA: Program for Culture and Conflict Studies at Naval Postgraduate School, 2008. Available: Naval Postgraduate School Collaborative Learning & Research Portal, Controlled Access < https://cle.nps.edu/xsl-portal/site/993b50bf-0751-4f9e-8f75-fa145bbf7908 > (Accessed November 29, 2014)
5	Landcover RC South (Polygon)	Afghanistan Landcover [Computer File]. Rome, Italy: United Nations Food and Agriculture Organization (FAO), 1992. Available: MapCruzin.com < http://www.mapcruzin.com/free-afghanistan-landcover-arcgis-maps-shapefiles.htm > (Accessed January 12, 2015)
6	Province or State Boundary (Polygon)	Derived from worldwide extent: Admin 1 - States, Provinces [Computer File]. Natural Earth Data, 2013. Available: Natural Earth Data < http://www.naturalearthdata.com/downloads/10m-cultural-vectors/ > (Accessed January 22, 2015)
7	Clan Level Boundaries (Polygon)	Afghan Tribal Shapefiles V_1 [Computer File]. Monterey, CA: Program for Culture and Conflict Studies at Naval Postgraduate School, 2008. Available: Naval Postgraduate School Collaborative Learning & Research Portal, Controlled Access < https://cle.nps.edu/xsl-portal/site/993b50bf-0751-4f9e-8f75-fa145bbf7908 > (Accessed November 29, 2014)
8	Super Tribe Level Boundaries (Polygon)	Afghan Tribal Shapefiles V_1 [Computer File]. Monterey, CA: Program for Culture and Conflict Studies at Naval Postgraduate School, 2008. Available: Naval Postgraduate School Collaborative Learning & Research Portal, Controlled Access < https://cle.nps.edu/xsl-portal/site/993b50bf-0751-4f9e-8f75-fa145bbf7908 > (Accessed November 29, 2014)
9	Tribe Level Boundaries (Polygon)	Afghan Tribal Shapefiles V_1 [Computer File]. Monterey, CA: Program for Culture and Conflict Studies at Naval Postgraduate School, 2008. Available: Naval Postgraduate School Collaborative Learning & Research Portal, Controlled Access < https://cle.nps.edu/xsl-portal/site/993b50bf-0751-4f9e-8f75-fa145bbf7908 > (Accessed November 29, 2014)

Table 7. List of other SC-GAP web services using external data sources

Other SC-GAP Web Services Using Geospatial Data from External Sources		
Ref. #	Feature Layer	Data Source Information
10	Afghanistan ACLED (Point)	ACLED Version 1 (1997-2009/2010) [Computer File]. Armed Conflict Location & Event Data Project (ACLED), 2010. Available: ACLED website < http://www.acleddata.com/?s=afghanistan > (Accessed January 29, 2015)
11	Airports (Point)	Airports and airfields in Afghanistan [Computer File]. Islamabad, Pakistan: Afghanistan Information Management Service (AIMS), 2000. Available: AIMS website < http://www.aims.org.af/ > (Accessed January 22, 2015)
12	Contour Lines (Line)	Elevation contour lines for RC-South in Afghanistan. Derived using elevation data from: Afghanistan Elevation (country mask)[Computer File],

		Washington DC: Consortium for Spatial Information (CGIAR-CSI). Available: DIVA-GIS < http://www.diva-gis.org/gdata > (Accessed November 30, 2014): Contour Lines [Computer File] Generated by Mark Aschenbrenner, November 30, 2014. Using: ArcMAP for Desktop [GIS]. Version 10.2. Redlands, CA: ESRI, 2013.
13	Cultivated Areas (Polygon)	Cultivated areas of Afghanistan [Computer File]. Islamabad, Pakistan: Afghanistan Information Management Service (1997-2005). Available: AIMS website < http://www.aims.org.af/ > (Accessed January 22, 2015)
14	Cultivated Areas RC-South (Polygon)	Derived from: Cultivated areas of Afghanistan [Computer File]. Islamabad, Pakistan: Afghanistan Information Management Service (1997-2005). Available: AIMS website < http://www.aims.org.af/ > (Accessed January 22, 2015)
15	Disputed Boundary Areas (Polygon)	Derived from: Admin 0 – Breakaway, Disputed Areas [Computer File]. Natural Earth Data using data from CIA World Factbook, 2013. Available: Natural Earth Data < http://www.naturalearthdata.com/downloads/10m-cultural-vectors/10m-admin-0-breakaway-disputed-areas/ > (Accessed January 22, 2015)
16	District Centers (Point)	Afghanistan District Centers (Towns), GIST 2009 [Computer File]. Athens, GA: Geographic Information Support Team (GIST) Repository at the University of Georgia, 2009. Available: GeoCommons < http://geocommons.com/overlays/15192 > (Accessed January 22, 2015)
17	Ecoregions (Polygon)	Terrestrial Ecoregions [Computer File]. Arlington, VA: The Nature Conservancy, 2009. Available: The Nature Conservancy < http://maps.tnc.org/gis_data.html > (Accessed January 12, 2015)
18	Elevation (Raster)	Afghanistan Elevation (country mask)[Computer File], Washington DC: Consortium for Spatial Information (CGIAR-CSI). Available: DIVA-GIS < http://www.diva-gis.org/gdata > (Accessed November 30, 2014)
19	Geographic Fault Lines (Line)	Geologic Faults of Afghanistan [Computer File]. Washington DC: U.S. Geological Survey - Earth Surface Processes Team, 2006. Available: Data.gov < http://catalog.data.gov/dataset?q=afghanistan+fault&sort=score+desc%2C+name+asc > (Accessed January 22, 2015)
20	Global Earthquake Hazard Frequency (Raster)	Earthquake Hazard Frequency [Computer File]. New York, NY: Center for Hazards and Risk Research (CHRR) at Columbia University, 2006. Available: CHRR website < https://www.ldeo.columbia.edu/chrr/ > (Accessed January 29, 2015)
21	Health Facilities (Point)	Afghanistan Health Facilities [Computer File]. Kabul, Afghanistan: Afghanistan Information Management Service, 2003. Available: AIMS website < http://www.aims.org.af/ > (Accessed January 22, 2015)
22	Household income generating activities (Polygon)	Central and Southern Afghanistan Household Income Generating Activities, May 2007 [Computer File]. Data from a special report by the Famine Early Warning Systems Network (FEWS NET). Washington, DC: U.S. Agency for International Development (USAID). Available: GeoCommons < http://geocommons.com/overlays/16080 > (Accessed January 22, 2015)
23	Irrigated Areas (Polygon)	Afghanistan Irrigated Areas [Computer File]. Rome, Italy: United Nations Food and Agriculture Organization (UNFAO), 1993. Available: MapCruzin.com < http://www.mapcruzin.com/free-afghanistan-irrigated-areas-arccgis-maps-shapefiles.htm > (Accessed January 12, 2015)

24	Key Historical Sites (Point)	Key historical sites for RC-South in Afghanistan. Derived using cultural site data from Afghanistan's most significant ancient sites and monuments [Website], Fort Collins, CO: Center for Environmental Management of Military Lands (CEMML) at Colorado State University. Available: CEMML website < http://www.cemml.colostate.edu/cultural/09476/afgh05b.html > (Accessed November 30, 2014): Key Historical Sites [Computer File] Generated by Jason Koo, November 30, 2014. Using: ArcMAP for Desktop [GIS]. Version 10.2. Redlands, CA: ESRI, 2013.
25	Nation Boundary AFG (Polygon)	Afghanistan Administrative Areas Level 0 [Computer File]. Global Administrative Areas (www.gadm.org), 2011. Available: DIVA-GIS < http://www.diva-gis.org/gdata > (Accessed January 22, 2015)
26	Oil Gas Fields (Polygon)	Oil and Gas Fields of Afghanistan [Computer File]. Washington DC: U.S. Geological Survey - Earth Surface Processes Team, 2006. Available: Data.gov < http://catalog.data.gov/dataset/oil-and-gas-fields-of-afghanistan-fldafg-shp > (Accessed January 22, 2015)
27	Oil Natural Gas Wells (Point)	Oil and Gas Wells of Afghanistan with Well Logs [Computer File]. Washington DC: U.S. Geological Survey - Earth Surface Processes Team, 2006. Available: Data.gov < http://catalog.data.gov/dataset/oil-and-gas-wells-of-afghanistan-with-well-logs-welllogafg-shp > (Accessed January 22, 2015)
28	Population Density District Level (Polygon)	Derived using district boundaries from Afghanistan Administrative Areas Level 2 [Computer File]. Global Administrative Areas (www.gadm.org), 2011. Available: DIVA-GIS < http://www.diva-gis.org/gdata > (Accessed January 22, 2015). Population data from Demographic Statistics (Afghanistan) [Website]. Kabul, Afghanistan: Central Statistics Office (CSO), 2014. Available: CSO website < http://cso.gov.af/en/page/demography-and-socile-statistics/demograph-statistics/3897111 > (Accessed January 22, 2015)
29	Population Density Province Level (Polygon)	Derived using provincial boundaries from Derived from worldwide extent: Admin 1 - States, Provinces [Computer File]. Natural Earth Data, 2013. Available: Natural Earth Data < http://www.naturalearthdata.com/downloads/10m-cultural-vectors/ > (Accessed January 22, 2015). Population data from Demographic Statistics (Afghanistan) [Website]. Kabul, Afghanistan: Central Statistics Office (CSO), 2014. Available: CSO website < http://cso.gov.af/en/page/demography-and-socile-statistics/demograph-statistics/3897111 > (Accessed January 22, 2015)
30	Predominant Religions (Polygon)	Afghan Tribal Shapefiles V_1 [Computer File]. Monterey, CA: Program for Culture and Conflict Studies at Naval Postgraduate School, 2008. Available: Naval Postgraduate School Collaborative Learning & Research Portal, Controlled Access < https://cle.nps.edu/xsl-portal/site/993b50bf-0751-4f9e-8f75-fa145bbf7908 > (Accessed November 29, 2014)
31	Railroad Lines (Line)	Worldwide shapefile: Railroads [Computer File]. Natural Earth Data, 2013. Available: Natural Earth Data < http://www.naturalearthdata.com/downloads/10m-cultural-vectors/ > (Accessed January 22, 2015)
32	Roads (Line)	Roads [Computer File]. Islamabad, Pakistan: Afghanistan Information Management Service (AIMS), 1998. Available: AIMS website < http://www.aims.org.af/ > (Accessed January 22, 2015)

33	Urban Areas (Polygon)	Urban Areas for RC-South in Afghanistan. Derived using population data from Demographic Statistics (Afghanistan) [Website]. Kabul, Afghanistan: Central Statistics Office (CSO), 2014. Available: CSO website < http://cso.gov.af/en/page/demography-and-socile-statistics/demograph-statistics/3897111 > (Accessed January 22, 2015): Urban Areas [Computer File]. Generated by Daniel Toshner, January 22, 2015. Using: ArcMap for Desktop [GIS]. Version 10.2. Redlands, CA: ESRI, 2013.
34	U.S. Military Bases (Point)	Wikipedia U.S. Bases [Computer File]. Source of geographic coordinates and information: Wikipedia < http://en.wikipedia.org/wiki/Category:Military_bases_of_the_United_States_in_Afghanistan >, 2014. Available: Naval Postgraduate School Collaborative Learning & Research Portal, Controlled Access < https://cle.nps.edu/xml-portal/site/993b50bf-0751-4f9e-8f75-fa145bbf7908/page/8faf6a43-6466-4d5f-801c-d5d11926c44f > (Accessed November 29, 2014)
35	Water Areas (Point)	Inland Water [Computer File]. DIVA-GIS, using data from Digital Chart of the World (DCW). Available: DIVA-GIS website < http://www.diva-gis.org/gdata > (Accessed January 22, 2015)
36	Water Lines (Line)	Inland Water [Computer File]. DIVA-GIS, using data from Digital Chart of the World (DCW). Available: DIVA-GIS website < http://www.diva-gis.org/gdata > (Accessed January 22, 2015)

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